



# High richness, new occurrences, and threatened species in a savanna grassland remnant in the largest Brazilian metropolis

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## Abstract

Parque Estadual do Juquery is the largest protected remnant of savanna grassland in the metropolitan region of São Paulo (MRSP). We conducted a floristic inventory and created a photographic record of the angiosperm flora of the savanna formations in this area and compared it with those of other Cerrado sites using Jaccard's similarity index. We present a list with 366 species, distributed in 58 botanical families. Asteraceae and Poaceae were the families with the highest species richness. Eighty-six new occurrences were recorded in the park. According to the São Paulo state Red List, 14 species are threatened by extinction, of which four are presumably extinct. Most species are herbaceous (36.0%) and sub-shrub plants (26.5%). No floristic similarity was observed with other savanna formations in the countryside of the state of São Paulo. Our results emphasize the importance of the Parque Estadual do Juquery for the conservation of savanna grassland formations in the MRSP and the protection of locally endangered species.

## Keywords

Brazilian savanna, floristic inventory, old-growth grassland, Poaceae, Asteraceae, tropical grassland

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## Introduction

In the Neotropical region, savannas cover more than two million square kilometers (Mistry 2000) and represent the second-largest vegetation formation in tropical America (Ratter et al. 2006). Among Neotropical savannas, the Cerrado is the most extensive and biodiverse (Ratter et al. 2006), with more than 12,000 plant species (Mendonça et al. 2008) distributed in a mosaic of physiognomies according to the forest-ecotone-grassland concept

(Coutinho 1978). This mosaic includes the savanna forest, termed “cerradão”, and a gradient of savanna-grassland formations consisting of a mixed flora with forest and grassland elements, termed “cerrado *stricto sensu*”, “campo cerrado”, “campo sujo”, and “campo limpo” (Coutinho 1978).

Despite the importance of the plant diversity of Cerrado, two decades ago, less than 20% of its area was



estimated to be undisturbed (Myers et al. 2000) and approximately 53% had been converted into pasture and monocultures (Klink and Machado 2005). These land cover changes reveal that the Cerrado biome has been highly influenced by anthropogenic pressure, especially agriculture, which could lead to the loss of up to 34% of the current 112 million hectares of remaining natural areas of Cerrado by 2050 (Strassburg et al. 2017). This scenario may be optimistic because it does not consider the current urban expansion rates of cities located in the Cerrado biome (Rumble et al. 2019). Based on the history of degradation of natural landscapes and the threat to species richness and endemism in the Cerrado, this biome has long been considered one of the priority areas for the conservation of global biodiversity (Myers et al. 2000).

Savanna-grassland formations (open habitats) comprise 64.4% of the Cerrado plant taxa, and 39.2% of its richness is represented by herbaceous plants (Filgueiras 2002; Mendonça et al. 2008), which are vital for the maintenance of ecological processes (Hoffmann et al. 2012; Parr et al. 2014). Also, the floral and faunal diversity in these formations (Tubelis and Cavalcanti 2001; Vynne et al. 2011) are essential for the maintenance of provisioning and regulating services in the ecosystem (Overbeck et al. 2015; Veldmann et al. 2015; Murphy et al. 2016), mainly hydrological processes (Scherer-Lorenzen et al. 2003; Honda and Durigan 2016). Despite their environmental role, grassland formations have fewer legally protected areas than tropical forest formations and, therefore, are more susceptible to land-use conversion (Veldman et al. 2015). This global reality is also observed in the Cerrado, especially in the state of São Paulo.

The prominent remnants of Cerrado in São Paulo are concentrated in the central region of the state (Durigan et al. 2003), represented mainly by more dense habitats, such as cerrado *stricto sensu* and cerradão, associated with deep, sandy soils (Ishara and Maimoni-Rodella 2012). Despite this biogeographical concentration, grassland fragments in the metropolitan region of São Paulo (MRSP) have also been reported (e.g., Usteri 1911; Joly 1950; Baitello et al. 2013; Beraldo et al. 2018). In this region is observed a typical flora of open Cerrado habitats, which are very distinct from those found in the central areas of the state (Durigan et al. 2003). The few sites that harbor this flora are relicts of the original vegetation of this biome (Raimundo 2006), and these are necessary for the conservation of rare and threatened species (Baitello et al. 2013; Beraldo et al. 2018). Still, few studies have been carried out in these fragments in the MRSP (e.g., Baitello et al. 2013; Beraldo et al. 2018; Silva et al. 2018). The lack of floristic surveys of the grasslands in the MRSP reveals a gap in knowledge on species diversity, especially for herbaceous plants, needed to understand the physiognomic and ecological characteristics and the conservation status of these areas.

New surveys and botanical lists of the Cerrado grassland vegetation complement the current knowledge of

the flora. Moreover, along with the systematization of the existing information, we report data on potentially threatened plant species, which are of great importance for the conservation of these formations' biodiversity. Surveys can be an essential step toward creating identification keys and photographic reference guides for other studies. Information on the floristic composition of grasslands of Cerrado formations in MRSP becomes even more important when considering the surrounding anthropogenic pressure of constant urban sprawl, which potentially leads to loss of habitats and, consequently, of species.

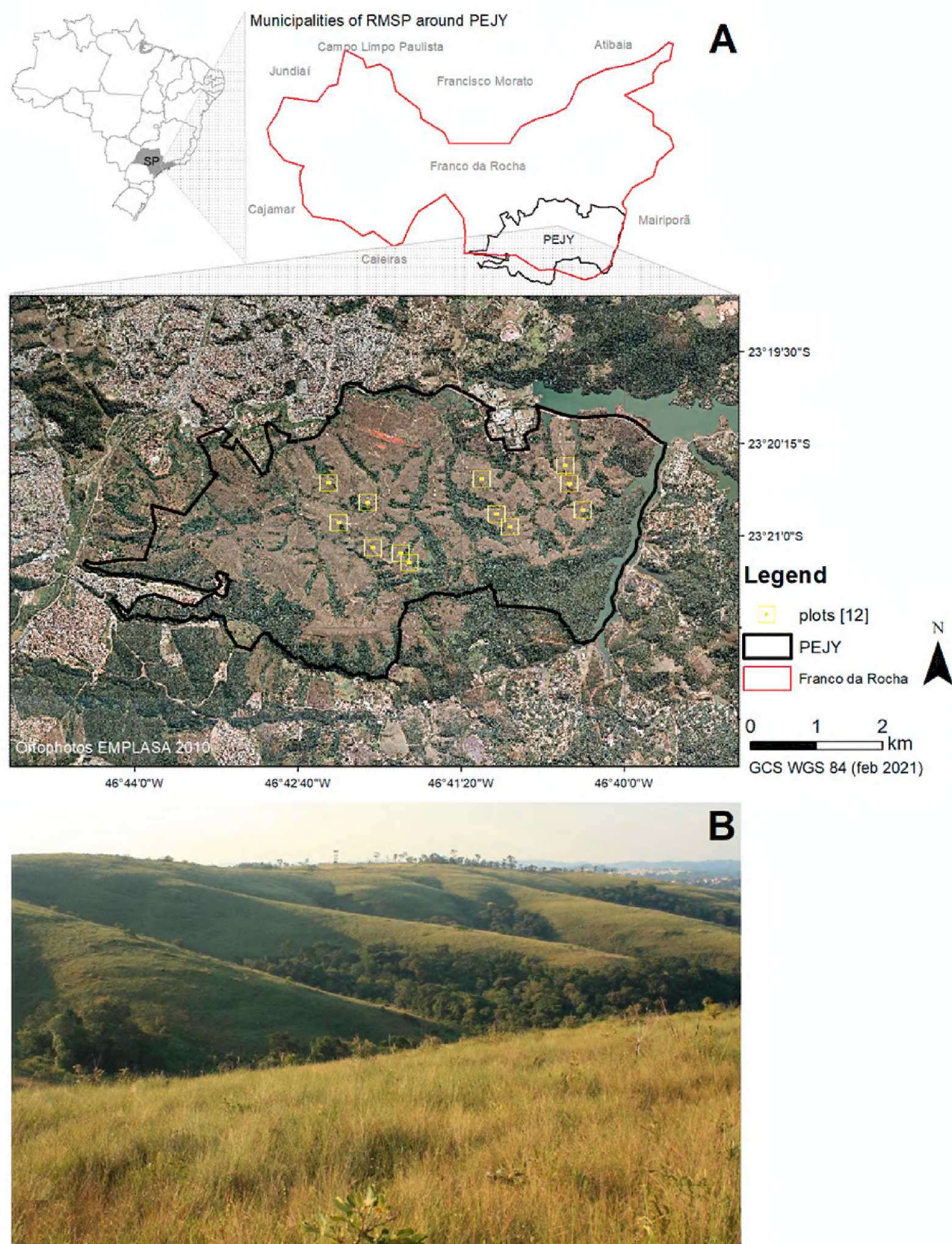
In this study we aim to provide an updated floristic inventory and create a photographic record of the angiosperm flora in the last and largest protected remnant of Brazilian grassland savanna in the MRSP. We also compared this vegetation's floristic similarity with those from other savannas (Cerrado) remnants, especially from São Paulo state.

## Study Area

We carried out this study in the Parque Estadual do Juquery in Portuguese (hereafter acronym PEJY), Franco da Rocha, São Paulo state, Brazil (23°20'52"S, 046°41'50"W at its center; Fig. 1A). This park comprises remnants of the Atlantic Forest and Cerrado, with most of the vegetation cover known as campo sujo; this park represents the largest remnant of this Cerrado phytophysiology in the MRSP. PEJY is a protected area created in 1993 and with an area of 2,058 ha. The land originally belonged to the State Psychiatric Hospital, which was managed by Dr. Franco da Rocha at the former Juquery Farm (Baitello et al. 2013). Because of the history of low-intensity use (Fraletti 1986), the natural cover of grassland and forest formations of Juquery Farm was maintained, despite the growing urbanization in its surroundings.

In PEJY, the altitude ranges from 730 to 950 m, the mean annual rainfall varies between 1200 and 2000 mm, and the average temperature is between 20 and 21 °C (Baitello et al. 2013). The climate in the region is influenced by the ocean, and there is no defined dry season (Cfb in the Köppen-Geiger classification system; Alvares et al. 2013). The park's geology is within the São Roque Group, with a lithological composition of phyllites and metasiltites and to a lesser extent, with eluvium-colluvium deposits and quartzites (Amorim et al. 2017). Haplyc acrisol and dystrophic cambisol are dominant (Rossi 2017), with a relief characterized by the presence of low hills with flat tops and steep valleys in mamelonized slopes covered mainly by campo sujo vegetation, in addition to campo cerrado in a few areas, and a drainage basin covered by ombrophilous forest (Baitello et al. 2013). These characteristics create a heterogeneous landscape of Cerrado campo sujo interspersed with ombrophilous Atlantic Forest and other savanna formations (Fig. 1B). PEJY also includes





**Figure 1. A.** Geographic location and boundaries of the Parque Estadual do Juquery (PEJY) and location of plots used as sampling points. **B.** View of the vegetation cover of PEJY with Cerrado campo sujo at the top of the hill and Atlantic Forest at the bottom of the valley.

springs that are tributaries of the Juquery River and the Paiva Castro reservoir of the Cantareira system, one of the primary water sources that supply the MRSP.

## Methods

**Sampling and recording the flora.** We recorded the flora of PEJY by systematically surveying woody and herbaceous plants as part of a larger project on the area's grassland community structure. We surveyed in plots and sub-plots distributed in areas with a predominance of campo sujo (Fig. 1A). Woody plants with a circumference at ground height (CGH) >3 cm were sampled in

12 plots of 10 × 25 m. For herbaceous and woody plants with CGH <3 cm, in each of these plots we delimited five 1 × 1 m sub-plots 4 m equidistant from each other, totaling 60 sub-plots. These systematic surveys were carried out in the dry (August 2017) and wet (February 2018) seasons.

During these periods, we also made additional monthly surveys of specimens with flowers and fruits during walks, covering roads and areas close to the plots, including campo cerrado. We made photographic records of species *in loco* during surveys. The images were not treated by any image software or any post-production, except for a photo of *Polygala pumila* Norlind taken in the



laboratory under a stereomicroscope. The photographs were all taken at PEJY by the first author and comprise a personal image library spanning 2014 to 2020.

**Creating a species list.** We identified the specimens collected consulting specialized literature for the plants of the state of São Paulo (e.g., Wanderley et al. 2001, 2002, 2005, 2007, 2016; Martins et al. 2009) and for specific families and groups (e.g., Caruzo and Cordeiro 2007; Borges and Forzza 2008; Hattori and Nakajima 2008, 2011; Heiden et al. 2009; Silva et al. 2018). We consulted specialists in the local flora (see Acknowledgments) to identify or confirm species. We compared our samples with those of the Forestry Institute Herbarium (Instituto Florestal; SPSF) and the Re flora Virtual Herbarium (2020). We prepared vouchers of species with flowers or fruits, especially for those considered rare, threatened, or endangered, or that had not been reported at the study area by Baitello et al. (2013). All vouchers are deposited at the Universidade Federal do ABC Herbarium (HUFABC), and additional duplicates are available at the Universidade Federal de São Paulo Herbarium (HUFSP) and the Forestry Institute Herbarium (SPSF).

Species nomenclature and synonyms were verified and updated using the Re flora Project (Flora do Brasil

2020). The conservation status of species followed the São Paulo state’s Red List of threatened plants (Mamede et al. 2007) and its updated version (São Paulo 2016).

After creating our species list, we added the species presented by Baitello et al. (2013) for the open formations (campo limpo, campo sujo, campo cerrado, and cerrado *stricto sensu*) to produce the final PEJY flora. We checked the names of species on Baitello et al.’s (2013) list to avoid synonyms.

**Floristic similarity.** We compared the flora composition with those from other Cerrado remnants in the states of São Paulo, Paraná, and Goiás, and in the Federal District (Table 1). Prior to analysis, we updated the names in the species lists in these areas according to the Flora do Brasil 2020 Project (Flora do Brasil 2020) to avoid synonyms. We carried out a comparison among areas using PAST v. 3.13 software (Hammer et al. 2001) based on the Jaccard similarity index applied to a hierarchical cluster analysis using the UPGMA algorithm (Legendre and Legendre 1998). We also tested our dataset using the Sørensen similarity index. As the structure of our cluster remained the same using both indexes, we only show here the one using Jaccard’s similarity index. We did not include in the analysis species occurring in only one of the areas.

**Table 1.** Flora, edaphic and climatic (Köppen-Geiger climate classification) information of the localities with Brazilian savanna used in the comparison with the present study in the Parque Estadual do Juquery, Franco da Rocha, SP.

Locality	Vegetation	Species richness	Soil	Climate	Reference
Fazenda Água Limpa, Brasília, DF	Campo sujo	153	Latosol	Aw	Munhoz and Felfili (2006)
Fazenda Água Fria, Alto Paraíso, GO	Campo úmido	181	Neosol	Aw	Munhoz and Felfili (2006)
Parque Estadual de Vila Velha, Ponta Grossa, PR	Campo seco	223	Latosol	Cfb	Silva et al. (2016)
	Campo úmido		Cambisol		
	Campo rupestre		Gleysol		
			Neosol		
Cidade Universitária Armando de Salles Oliveira, Campus USP, Butantã, São Paulo, SP	Campo sujo	311	Argisol Cambisol	Cwb	Joly (1950)
Estação Ecológica de Assis, Assis, SP	Cerrado <i>stricto sensu</i> Cerradão	369	Latosol Gleysol	Cwa Cfa	Rossatto et al. (2008) + Pinheiro and Durigan (2012)
Cerrado de Emas, Pirassununga, SP	Campo sujo Campo cerrado Cerrado <i>stricto sensu</i> Cerradão	358	Latosol	Cwa	Batalha et al. (1997)
Fazenda da Máquina, Itirapina, SP	Campo sujo Campo úmido	337	Neosol	Cwa	Tannus and Assis (2004)
Parque Estadual do Jaraguá, São Paulo, SP	Campo cerrado Cerrado rupestre Cerrado <i>stricto sensu</i>	191	Cambisol	Cfb	Beraldo et al. (2018)
Parque Estadual do Juquery, Franco da Rocha, SP	Campo limpo Campo sujo Campo cerrado Cerrado <i>stricto sensu</i>	366	Argisol Cambisol	Cfb	This study + Baitello et al. (2013)
Área de Relevante Interesse Ecológico (ARIE) Cerrado Pé-de-gigante, Santa Rita do Passa Quatro, SP	Campo sujo Campo cerrado Cerrado <i>stricto sensu</i> Cerradão	353	Latosol	Cwa	Batalha and Mantovani (2001)
Pedregulho municipality, SP	Campo sujo Campo cerrado Cerrado <i>stricto sensu</i>	412	Latosol Neosol	Cwa	Sasaki and Mello-Silva (2008)
Pratânia municipality, SP	Cerrado <i>stricto sensu</i>	115	Latosol Argisol	Cwa	Carvalho et al. (2010)
Reserva Biológica de Mogi Guaçu, Mogi Guaçu, SP	Campo cerrado Cerrado <i>stricto sensu</i>	503	Latosol	Cwa	Mantovani and Martins (1993)



Results

Based on field sampling, we recorded 201 species of angiosperms in PEJY, 156 of them with photographic records (Table 2; Figs. 3–22). When we compiled our and Baitello et al.’s (2013) lists, we reached a total of 366 species for open habitats of PEJY. The species are distributed in 58 botanical families, with Asteraceae (75 spp.) and Poaceae (50 spp.) as the richest. Other important families are Fabaceae (30 spp.), Melastomataceae (22 spp.), Rubiaceae (12 spp.), Myrtaceae (11 spp.), Lamiaceae (10

spp.), Convolvulaceae (10 spp.), and Malvaceae (9 spp.). The genera with the highest species richness are *Baccharis* L. (20 spp.), *Paspalum* L. (14 spp.), *Lessingianthus* H.Rob. (7 spp.), and *Axonopus* P.Beauv. (6 spp.). Among the species recorded, 132 are herbaceous (36.0%), 97 are sub-shrubs (26.5%), 88 are shrubs (24.0%), 31 are trees (8.5%) 16 are vines (4.4%), and two are palms (0.6%). We recorded three potentially invasive exotic grass species, *Hyparrhenia rufa* (Nees) Stapf, *Melinis minutiflora* P.Beauv., and *Urochloa brizantha* (Hochst. ex A. Rich.) R.D.Webster, in the study area and at other sites, such as

**Table 2.** Angiosperm species from Parque Estadual do Juquery (PEJY), Franco da Rocha - SP, Brazil, and its conservation status according to São Paulo (2016). Conservation status: CR = Critically Endangered, EN = Endangered, EX = Presumably Extinct, NT = Near Threatened, and VU = Vulnerable. Acronyms: vck = collector number, HUFABC = herbarium voucher number and ref. = bibliographic reference.

Families/Species	Habit	Figure	Conservation status	Reported by Baitello et al. (2013)	vck/HUFABC/ref.
<b>Acanthaceae</b>					
<i>Ruellia geminiflora</i> Kunth	sub-shrub	3A		X	316/2025
<b>Amaranthaceae</b>					
<i>Pfaffia jubata</i> Mart.	sub-shrub	-			Baitello et al. 2013
<b>Amaryllidaceae</b>					
<i>Hippeastrum morelianum</i> Lem.	herb	-	VU		Baitello et al. 2013
<b>Annonaceae</b>					
<i>Duguetia furfuracea</i> (A.St.-Hil.) Saff.	shrub	3B		X	183/2183, 184/2184
<b>Apiaceae</b>					
<i>Eryngium canaliculatum</i> Cham. & Schltdl.	herb	-			Baitello et al. 2013
<i>Eryngium junceum</i> Cham. & Schltdl.	herb	-			Baitello et al. 2013
<i>Eryngium pristis</i> Cham. & Schltdl.	herb	3C		X	185/2185
<b>Apocynaceae</b>					
<i>Barjonia erecta</i> (Vell.) K.Schum.	sub-shrub	-			Baitello et al. 2013
<i>Mandevilla coccinea</i> (Hook. & Arn.) Woodson	sub-shrub	-			Baitello et al. 2013
<i>Mandevilla emarginata</i> (Vell.) C.Ezcurra	sub-shrub	-			Baitello et al. 2013
<i>Mandevilla pohliana</i> (Stadelm.) A.H.Gentry	sub-shrub	-			Baitello et al. 2013
<i>Mandevilla velame</i> (A.St.-Hil.) Pichon	sub-shrub	3D		X	160/2172
<i>Oxypetalum appendiculatum</i> Mart.	vine	-			Baitello et al. 2013
<i>Oxypetalum capitatum</i> Mart.	sub-shrub	-			Baitello et al. 2013
<i>Oxypetalum erectum</i> Mart.	herb	3E		X	226/2068
<b>Araliaceae</b>					
<i>Hydrocotyle pusilla</i> A.Rich.	herb	-	EX		324/2033
<i>Didymopanax macrocarpus</i> (Cham. & Schltdl.) Seem.	shrub	3F		X	99/1978
<b>Arecaceae</b>					
<i>Allagoptera campestris</i> (Mart.) Kuntze	palm	-			Baitello et al. 2013
<i>Geonoma schottiana</i> Mart.	palm	-			Baitello et al. 2013
<b>Aristolochiaceae</b>					
<i>Aristolochia labiata</i> Willd.	vine	3G		X	328/2037, 3292038
<b>Asteraceae</b>					
<i>Acanthospermum australe</i> (Loefl.) Kuntze	herb	-			214/2056
<i>Achyrocline satureioides</i> (Lam.) DC.	herb	-		X	69/2001
<i>Ageratum fastigiatum</i> (Gardner) R.M.King & H.Rob.	sub-shrub	-		X	290/2210
<i>Aldama robusta</i> (Gardner) E.E.Schill. & Panero	sub-shrub	3H			279/2144, 280/2145
<i>Aspilia foliacea</i> (Spreng.) Baker	herb	4A		X	333/2042
<i>Ayapana amygdalina</i> (Lam.) R.M.King & H.Rob.	sub-shrub	4B			65/1997, 66/1998, 67/1999, 68/2000
<i>Baccharis aphylla</i> (Vell.) DC.	sub-shrub	-		X	334/2043
<i>Baccharis articulata</i> (Lam.) Pers.	sub-shrub	4C			100/1969, 101/1970, 102/1971
<i>Baccharis brevifolia</i> DC.	sub-shrub	-		X	168/2071, 169/2072
<i>Baccharis caprariifolia</i> DC.	sub-shrub	-			Baitello et al. 2013
<i>Baccharis dracunculifolia</i> DC.	shrub	-			Baitello et al. 2013
<i>Baccharis erigeroides</i> DC.	sub-shrub	-			Baitello et al. 2013
<i>Baccharis gracilis</i> DC.	herb	-			Baitello et al. 2013
<i>Baccharis helichrysoides</i> DC.	sub-shrub	4D		X	134/1940, 135/1941



Families/Species	Habit	Figure	Conservation status	Reported by Baitello et al. (2013)	vck/HUFABC/ref.
<i>Baccharis intermixa</i> Gardner	sub-shrub	-			Baitello et al. 2013
<i>Baccharis junciformis</i> DC.	sub-shrub	-			Baitello et al. 2013
<i>Baccharis linearifolia</i> Pers.	sub-shrub	-			Baitello et al. 2013
<i>Baccharis maxima</i> Baker	sub-shrub	-			Baitello et al. 2013
<i>Baccharis montana</i> DC.	sub-shrub	-			Baitello et al. 2013
<i>Baccharis myriocephala</i> DC.	sub-shrub	-			Baitello et al. 2013
<i>Baccharis pentaptera</i> DC.	sub-shrub	-			Baitello et al. 2013
<i>Baccharis pentodonta</i> Malme	sub-shrub	-			Baitello et al. 2013
<i>Baccharis reticularia</i> DC.	sub-shrub	-			Baitello et al. 2013
<i>Baccharis subdentata</i> DC.	sub-shrub	4E		X	43/1958, 44/1959, 61/1993
<i>Baccharis tarchonanthoides</i> DC.	shrub	-			Baitello et al. 2013
<i>Baccharis cognata</i> DC.	sub-shrub	4F		X	147/2123, 148/2124, 149/2125
<i>Calea cuneifolia</i> DC.	herb	-			Baitello et al. 2013
<i>Campovassouria cruciata</i> (Vell.) R.M.King & H.Rob.	shrub	4G		X	331/2040, 332/2041
<i>Campuloclinium macrocephalum</i> (Less.) DC.	herb	-		X	202/2202, 203/2203
<i>Campuloclinium megacephalum</i> (Baker) R.M.King & H.Rob.	herb	-			Baitello et al. 2013
<i>Chaptalia integerrima</i> (Vell.) Burkart	sub-shrub	-			Baitello et al. 2013
<i>Chaptalia mandonii</i> Sch.Bip. ex Burkart	herb	4H			330/2039
<i>Chresta sphaerocephala</i> DC.	shrub	5A		X	303/2165, 304/2166
<i>Chromolaena congesta</i> (Hook. & Arn.) R.M.King & H.Rob.	sub-shrub	5B			234/2078
<i>Chromolaena hirsuta</i> (Hook. & Arn.) R.M.King & H.Rob.	sub-shrub	5C		X	200/2200, 201/2201
<i>Chromolaena laevigata</i> (Lam.) R.M.King & H.Rob.	sub-shrub	-			Baitello et al. 2013
<i>Chrysolaena cognata</i> (Less.) Dematt.	sub-shrub	5D			152/2128, 153/2129
<i>Chrysolaena desertorum</i> (Mart. ex DC.) Dematt.	herb	5E			151/2127
<i>Chrysolaena obovata</i> (Less.) Dematt.	sub-shrub	5F		X	139/1945
<i>Chrysolaena simplex</i> (Less.) Dematt.	herb	-			140/1946
<i>Clibadium armanii</i> (Balb.) Sch.Bip. ex O.E.Schulz	shrub	-			Baitello et al. 2013
<i>Conyza primulifolia</i> (Lam.) Cuatrec. & Lourteig	herb	5G			123/1914
<i>Grazielia intermedia</i> (DC.) R.M.King & H.Rob.	shrub	5H		X	24/1900, 25/1901
<i>Hoehnephytum trixoides</i> (Gardner) Cabrera	shrub	6A			64/1996, 287/2179
<i>Inulopsis camporum</i> (Gardner) G.L.Nesom	herb	-			Baitello et al. 2013
<i>Inulopsis scaposa</i> (DC.) O.Hoffm.	herb	6B		X	109/1980
<i>Koanophyllon myrtilloides</i> (DC.) R.M.King & H.Rob.	sub-shrub	6C			296/2152, 288/2180, 289/2181
<i>Lessingianthus argyrophyllus</i> (Less.) H.Rob.	sub-shrub	6D			23/1899, 150/2126
<i>Lessingianthus cephalotes</i> (DC.) H.Rob.	sub-shrub	6E			335/2044, 336/2045
<i>Lessingianthus erythrophilus</i> (DC.) H.Rob.	sub-shrub	6F			337/2046, 338/2047, 340/2049
<i>Lessingianthus glabratus</i> (Less.) H.Rob.	sub-shrub	-			162/2174
<i>Lessingianthus grandiflorus</i> (Less.) H.Rob.	sub-shrub	-			Baitello et al. 2013
<i>Lessingianthus roseus</i> (Mart. ex DC.) H.Rob.	sub-shrub	7A			273/2120, 277/2142, 278/2143
<i>Lessingianthus virgulatus</i> (Mart. ex DC.) H.Rob.	sub-shrub	7B			45/1960, 46/1961, 47/1962
<i>Lucilia lycopodioides</i> (Less.) S.E.Freire	herb	6G		X	95/2019
<i>Mikania nummularia</i> DC.	sub-shrub	-		X	62/1994
<i>Mikania officinalis</i> Mart.	sub-shrub	6H		X	138/1944
<i>Mikania sessilifolia</i> DC.	sub-shrub	7C		X	63/1995, 302/2164
<i>Moquiniastrum paniculatum</i> (Less.) G.Sancho	shrub	-			70/2002, 71/2003
<i>Moquiniastrum polymorphum</i> (Less.) G.Sancho	tree	-			Baitello et al. 2013
<i>Orthopappus angustifolius</i> (Sw.) Gleason	herb	-		X	72/2004, 239/2083
<i>Piptocarpha axilaris</i> (Less.) Baker	shrub	-			Baitello et al. 2013
<i>Piptocarpha macropoda</i> (DC.) Baker	shrub	-			Baitello et al. 2013
<i>Piptocarpha rotundifolia</i> Baker	shrub	-			Baitello et al. 2013
<i>Pterocaulon alopecuroides</i> (Lam.) DC.	sub-shrub	-			212/2054, 213/2055
<i>Richterago radiata</i> (Vell.) Roque	herb	-			236/2080
<i>Solidago chilensis</i> Meyen	sub-shrub	-		X	237/2081, 238/2082
<i>Stenocephalum megapotamicum</i> (Spreng.) Sch.Bip.	sub-shrub	-		X	204/2204
<i>Stevia lundiana</i> DC.	herb	-		X	235/2079
<i>Symphyopappus cuneatus</i> Sch.Bip ex Baker	sub-shrub	-			Baitello et al. 2013
<i>Symphyopappus reticulatus</i> Baker	sub-shrub	-			210/2052, 211/2053
<i>Tilesia baccata</i> (L.f.) Pruski	shrub	7D			136/1942, 137/1943
<i>Vernonanthura divaricata</i> (Spreng.) H.Rob.	shrub	-			Baitello et al. 2013
<i>Vernonanthura montevidensis</i> (Spreng.) H.Rob.	shrub	-			Baitello et al. 2013
<i>Vernonanthura polyanthes</i> (Spreng.) A.J.Vega & Dematt.	shrub	-			80/1919
<b>Bignoniaceae</b>					
<i>Adenocalymma pedunculatum</i> (Vell.) L.G.Lohmann	shrub	7E		X	189/2189



Families/Species	Habit	Figure	Conservation status	Reported by Baitello et al. (2013)	vck/HUFABC/ref.
<i>Anemopaegma arvense</i> (Vell.) Stellfeld ex De Souza	sub-shrub	-	EN		Baitello et al. 2013
<i>Fridericia platyphylla</i> (Cham.) L.G.Lohmann	shrub	7F		191/2191, 192/2192	
<i>Handroanthus ochraceus</i> (Cham.) Mattos	tree	-		Baitello et al. 2013	
<i>Jacaranda oxyphylla</i> Cham.	shrub	8A		X	39/1931
<i>Zeyheria montana</i> Mart.	shrub	8B		X	190/2190
<b>Boraginaceae</b>					
<i>Varronia calocephala</i> (Cham.) Friesen	sub-shrub	8C			256/2100
<b>Bromeliaceae</b>					
<i>Dyckia tuberosa</i> (Vell.) Beer	herb	8D		X	339/2048
<b>Calophyllaceae</b>					
<i>Kiellmeyera coriacea</i> Mart.	tree	-			Baitello et al. 2013
<i>Kiellmeyera corymbosa</i> Mart.	shrub	-			Baitello et al. 2013
<i>Kiellmeyera grandiflora</i> (Wawra) Saddi	tree	-			Baitello et al. 2013
<i>Kiellmeyera pumila</i> Pohl	sub-shrub	8E		X	121/1912
<i>Kiellmeyera variabilis</i> Mart. & Zucc.	shrub	-			Baitello et al. 2013
<b>Campanulaceae</b>					
<i>Lobelia camporum</i> Pohl	herb	8F		X	266/2110, 118/1909
<i>Wahlenbergia brasiliensis</i> Cham.	herb	8G		X	35/1927, 267/2111
<b>Caryocaraceae</b>					
<i>Caryocar brasiliense</i> A.St.-Hil.	tree	-			Baitello et al. 2013
<b>Celastraceae</b>					
<i>Peritassa campestris</i> (Cambess.) A.C.Sm.	shrub	8H		X	317/2026, 318/2027
<i>Plenckia populnea</i> Reissek	tree	-			Baitello et al. 2013
<b>Convolvulaceae</b>					
<i>Distimake cissoides</i> (Lam.) A.R.Simões & Staples	vine	-			Baitello et al. 2013
<i>Distimake hirsutus</i> (O'Donell) Petrongari & Sim.-Bianch.	vine	9A			20/1896
<i>Distimake macrocalyx</i> (Ruiz & Pav.) A.R.Simões & Staples	vine	-			Baitello et al. 2013
<i>Distimake tomentosus</i> (Choisy) Petrongari & Sim.-Bianch.	sub-shrub	9B		X	19/1895
<i>Evolvulus macroblepharis</i> Mart.	herb	9C		X	129/1935
<i>Evolvulus sericeus</i> Sw.	herb	9D			119/1910, 326/2035, 327/2036
<i>Ipomoea argentea</i> Meisn.	sub-shrub	9E		X	159/2171
<i>Ipomoea coccinea</i> L.	vine	-			Baitello et al. 2013
<i>Ipomoea delphinioides</i> Choisy	sub-shrub	9F		X	120/1911
<i>Ipomoea procumbens</i> Mart. ex Choisy	vine	-			Baitello et al. 2013
<b>Cucurbitaceae</b>					
<i>Cayaponia cabocla</i> (Vell.) Mart.	vine	-			Baitello et al. 2013
<i>Cayaponia espelina</i> (Silva Manso) Cogn.	vine	9G		X	29/1952, 30/1953
<i>Melothria campestris</i> (Naudin) H.Schaefer. & S.S.Renner	vine	-			Baitello et al. 2013
<b>Cyperaceae</b>					
<i>Bulbostylis hirtella</i> (Schrader.) Urb.	herb	-			154/2130
<i>Bulbostylis junciformis</i> (Kunth) C.B.Clarke	herb	-			181/2160
<i>Bulbostylis paradoxa</i> (Spreng.) Lindm.	herb	-			Baitello et al. 2013
<i>Rhynchospora globosa</i> (Kunth) Roem. & Schult.	herb	9H			157/2133
<i>Rhynchospora warmingii</i> Boeckeler	herb	-			Baitello et al. 2013
<b>Dilleniaceae</b>					
<i>Davilla elliptica</i> A.St.-Hil.	vine	-		X	34/1926
<b>Ericaceae</b>					
<i>Gaylussacia brasiliensis</i> (Spreng.) Meisn.	shrub	-			Baitello et al. 2013
<b>Erythroxylaceae</b>					
<i>Erythroxylum campestre</i> A.St.-Hil.	shrub	10A		X	97/1906, 98/1907, 320/2029
<i>Erythroxylum cuneifolium</i> Mart. O.E.Schulz	shrub	-			Baitello et al. 2013
<i>Erythroxylum deciduum</i> A.St.-Hil.	shrub	-			Baitello et al. 2013
<i>Erythroxylum microphyllum</i> A.St.-Hil.	shrub	-			Baitello et al. 2013
<i>Erythroxylum suberosum</i> A.St.-Hil.	shrub	10B		X	96/1905
<b>Euphorbiaceae</b>					
<i>Croton campestris</i> A.St.-Hil., A.Juss. & Cambess.	shrub	-			Baitello et al. 2013
<i>Croton didrichsenii</i> G.L.Webster	sub-shrub	10C			166/2178
<i>Croton lundianus</i> (Didr.) Müll.Arg.	herb	10D		X	175/2137, 176/2138
<i>Euphorbia potentilloides</i> Boiss.	herb	10E		X	94/2014
<i>Manihot caeruleascens</i> Pohl	shrub	-			Baitello et al. 2013
<i>Sapium glandulosum</i> (L.) Morong	shrub	-			Baitello et al. 2013
<b>Fabaceae</b>					
<i>Chamaecrista cathartica</i> (Mart.) H.S.Irwin & Barneby	sub-shrub	10F		X	161/2173



Families/Species	Habit	Figure	Conservation status	Reported by Baitello et al. (2013)	vck/HUFABC/ref.
<i>Chamaecrista langsdorffii</i> (Kunth ex Vogel) Britton ex Pittier	sub-shrub	-			198/2198
<i>Chamaecrista nictitans</i> subsp. <i>patellaria</i> (DC. ex Collad.) H.S.Irwin & Barneby	sub-shrub	-			Baitello et al. 2013
<i>Clitoria guianensis</i> (Aubl.) Benth.	sub-shrub	10G		X	195/2195
<i>Collaea speciosa</i> (Loisel.) DC.	shrub	-			Baitello et al. 2013
<i>Copaifera langsdorffii</i> Desf.	tree	-			Baitello et al. 2013
<i>Crotalaria micans</i> Link	sub-shrub	-			Baitello et al. 2013
<i>Crotalaria unifoliolata</i> Benth.	sub-shrub	10H		X	131/1937
<i>Dalbergia brasiliensis</i> Vogel	tree	-			Baitello et al. 2013
<i>Dalbergia miscolobium</i> Benth.	tree	-			Baitello et al. 2013
<i>Desmodium subsecundum</i> Vogel	herb	-			Baitello et al. 2013
<i>Eriosema campestre</i> var. <i>macrophyllum</i> (Gear) Fortunato	sub-shrub	-			233/2077
<i>Eriosema crinitum</i> (Kunth) G.Don	sub-shrub	11A			270/2117
<i>Eriosema heterophyllum</i> Benth.	herb	11B		X	56/1988, 298/2161
<i>Eriosema platycarpon</i> Micheli	herb	-			Baitello et al. 2013
<i>Cerradicola decumbens</i> (Benth.) L.P.Queiroz	vine	11C			257/2101, 258/2102
<i>Betencourtia martii</i> (DC.) L.P.Queiroz	vine	11D		X	314/2023, 315/2024
<i>Nanogalactia pretiosa</i> (Burkart) L.P.Queiroz	vine	11E			167/2051
<i>Leuchodoron incuriale</i> (Vell.) Barneby & J.W.Grimes	tree	-			Baitello et al. 2013
<i>Mimosa daleoides</i> Benth.	shrub	-			Baitello et al. 2013
<i>Mimosa debilis</i> Humb. & Bonpl. ex Willd.	herb	11F		X	193/2193
<i>Mimosa dolens</i> var. <i>acerba</i> (Benth.) Barneby	sub-shrub	12A		X	194/2194
<i>Periandra mediterranea</i> (Vell.) Taub.	shrub	-			Baitello et al. 2013
<i>Platypodium elegans</i> Vogel	tree	-			Baitello et al. 2013
<i>Senna rugosa</i> (G.Don) H.S.Irwin & Barneby	shrub	11G		X	196/2196, 197/2197
<i>Stryphnodendron rotundifolium</i> Mart.	tree	-			Baitello et al. 2013
<i>Stylosanthes acuminata</i> M.B.Ferreira & Sousa Costa	sub-shrub	-			145/1951
<i>Stylosanthes guianensis</i> (Aubl.) Sw.	herb	-			Baitello et al. 2013
<i>Zornia crinita</i> (Mohlenbr.) Vanni.	herb	-			Baitello et al. 2013
<i>Zornia reticulata</i> Sm.	sub-shrub	11H			177/2156
<b>Gentianaceae</b>					
<i>Calolisianthus amplissimus</i> (Mart.) Gilg	herb	12B		X	271/2118, 272/2119
<i>Calolisianthus pendulus</i> (Mart.) Gilg	sub-shrub	-			Baitello et al. 2013
<i>Calolisianthus speciosus</i> (Cham. & Schltdl.) Gilg	sub-shrub	-			Baitello et al. 2013
<i>Curtia tenuifolia</i> (Aubl.) Knobl.	herb	-	CR		Baitello et al. 2013
<i>Deianira chiquitana</i> Herzog	herb	-			Baitello et al. 2013
<i>Deianira nervosa</i> Cham. & Schltdl.	herb	12C		X	232/2076, 268/2115, 269/2116
<b>Gesneriaceae</b>					
<i>Sinningia allagophylla</i> (Mart.) Wiehler	herb	-		X	130/1936
<b>Hypericaceae</b>					
<i>Vismia micrantha</i> A.St.-Hil.	tree	-			Baitello et al. 2013
<b>Iridaceae</b>					
<i>Calydorea campestris</i> (Klatt) Baker	herb	-			Baitello et al. 2013
<i>Gelasine coerulea</i> (Vell.) Ravenna	herb	-			Baitello et al. 2013
<i>Sisyrinchium purpurellum</i> Ravenna	herb	12D			312/2021, 341/2050
<i>Sisyrinchium restioides</i> Spreng.	herb	12E		X	209/2209
<i>Sisyrinchium vaginatum</i> Spreng.	herb	-			Baitello et al. 2013
<i>Trimezia juncifolia</i> (Klatt) Benth. & Hook.f.	herb	-			Baitello et al. 2013
<b>Lamiaceae</b>					
<i>Aegiphila integrifolia</i> (Jacq.) B.D.Jacks.	shrub	-			Baitello et al. 2013
<i>Aegiphila verticillata</i> Vell.	tree	12F		X	174/2136
<i>Cantinoa althaeifolia</i> (Pohl ex Benth.) Harley & J.F.B.Pastore	shrub	12G			274/2139, 275/2140
<i>Cantinoa plectranthoides</i> (Benth.) Harley & J.F.B.Pastore	herb	13A		X	128/1934, 323/2032
<i>Eriope crassipes</i> Benth.	herb	13B		X	321/2030, 322/2031
<i>Hyptis nudicaulis</i> Benth.	herb	13C		X	146/2122
<i>Medusantha crinita</i> (Benth.) Harley & J.F.B.Pastore	shrub	13D			300/2162, 301/2163
<i>Rhabdocaulon denudatum</i> (Benth.) Epling	herb	13E		X	87/1966
<i>Salvia minarum</i> Briq.	herb	13F		X	182/2182
<i>Vitex polygama</i> Cham.	tree	-			Baitello et al. 2013
<b>Lauraceae</b>					
<i>Ocotea corymbosa</i> (Meisn.) Mez	tree	-			Baitello et al. 2013
<i>Ocotea minarum</i> (Nees & Mart.) Mez	tree	-			Baitello et al. 2013



Families/Species	Habit	Figure	Conservation status	Reported by Baitello et al. (2013)	vck/HUFABC/ref.
<i>Ocotea pulchella</i> (Nees & Mart.) Mez	tree	-			Baitello et al. 2013
<i>Ocotea velloziana</i> (Meisn.) Mez	tree	-			Baitello et al. 2013
<i>Ocotea velutina</i> (Nees) Mart. ex B.D.Jacks.	tree	-			Baitello et al. 2013
Lythraceae					
<i>Cuphea linarioides</i> Cham. & Schltdl.	herb	-			Baitello et al. 2013
<i>Lafoensia pacari</i> A.St.-Hil.	tree	-			Baitello et al. 2013
Malpighiaceae					
<i>Banisteriopsis campestris</i> (A.Juss.) Little	sub-shrub	13G		X	229/2073, 230/2074
<i>Byrsonima coccolobifolia</i> Kunth	tree	-			Baitello et al. 2013
<i>Byrsonima guillemiana</i> A.Juss.	shrub	13H		X	221/2063
<i>Byrsonima intermedia</i> A.Juss.	shrub	14A		X	219/2061
<i>Byrsonima subterranea</i> Brade & Markgr.	sub-shrub	14B		X	108/1977, 220/2062, 222/2064
<i>Camarea hirsuta</i> A.St.-Hil.	sub-shrub	-	EN		Baitello et al. 2013
<i>Heteropterys umbellata</i> A.Juss.	shrub	-			Baitello et al. 2013
Malvaceae					
<i>Helicteris brevispira</i> A.Juss.	shrub	-			Baitello et al. 2013
<i>Hibiscus kitaibelifolius</i> A.St.-Hil.	shrub	-			Baitello et al. 2013
<i>Krapovickasia macrodon</i> (A.DC.) Fryxell	herb	14C		X	127/1933
<i>Peltaea polymorpha</i> (A.St.-Hil.) Krapov. & Cristóbal	herb	14D		X	262/2106, 263/2107
<i>Sida glaziovii</i> K.Schum.	sub-shrub	14E			264/2108, 265/2109
<i>Sida linifolia</i> Juss. ex Cav.	sub-shrub	-			Baitello et al. 2013
<i>Sida rhombifolia</i> L.	herb	-			231/2075
<i>Waltheria communis</i> A.St.-Hil.	sub-shrub	-			Baitello et al. 2013
<i>Waltheria indica</i> L.	herb	14F			173/2135
Melastomataceae					
<i>Acisanthera quadrata</i> Pers.	shrub	-			Baitello et al. 2013
<i>Acisanthera variabilis</i> (Naud.) Triana	herb	14G			299/2121
<i>Cambessedesia espora</i> (A.St.-Hil. ex Bonpl.) DC.	sub-shrub	14H		X	40/1955, 41/1956, 51/1983
<i>Chaetogastra gracilis</i> (Bonpl.) DC.	sub-shrub	15A		X	255/2099
<i>Chaetogastra hieracioides</i> DC.	sub-shrub	-			Baitello et al. 2013
<i>Chaetostoma glaziovii</i> Cogn.	shrub	-			Baitello et al. 2013
<i>Leandra acutiflora</i> (Naudin) Cogn.	shrub	-			Baitello et al. 2013
<i>Leandra fluminensis</i> Cogn.	shrub	-			Baitello et al. 2013
<i>Leandra lindeniana</i> Cogn.	shrub	-			Baitello et al. 2013
<i>Leandra polystachya</i> (Naudin) Cogn.	shrub	15B		X	36/1928, 37/1929, 38/1930
<i>Miconia albicans</i> (Sw.) Triana	shrub	15C			79/1918
<i>Miconia latecrenata</i> (DC.) Naudin	shrub	-			Baitello et al. 2013
<i>Miconia ligustroides</i> (DC.) Naudin	tree	15D		X	52/1984, 53/1985, 54/1986, 55/1987
<i>Miconia pusilliflora</i> (DC.) Naudin	shrub	-			Baitello et al. 2013
<i>Miconia stenostachya</i> DC.	shrub	-			Baitello et al. 2013
<i>Microlicia isophylla</i> DC.	sub-shrub	15E		X	253/2097
<i>Pleroma frigidulum</i> (DC.) Triana	sub-shrub	-			Baitello et al. 2013
<i>Pleroma molle</i> (Cham.) Triana	sub-shrub	15F			313/2022
<i>Pleroma villosissimum</i> Triana	sub-shrub	-			Baitello et al. 2013
<i>Tibouchina dubia</i> (Cham.) Cogn.	shrub	-			Baitello et al. 2013
<i>Tibouchina versicolor</i> Cogn.	shrub	-			Baitello et al. 2013
<i>Trembleya phlogiformis</i> Mart. & Schrank ex DC.	sub-shrub	15G		X	254/2098, 188/2188
Menispermaceae					
<i>Cissampelos ovalifolia</i> DC.	herb	15H		X	17/1893, 18/1894
Myrtaceae					
<i>Campomanesia guazumifolia</i> (Cambess.) O.Berg	shrub	-			Baitello et al. 2013
<i>Campomanesia pubescens</i> (Mart. ex DC.) O.Berg	shrub	16A		X	89/1968, 311/2020
<i>Eugenia bimarginata</i> DC.	shrub	16B		X	81/1920, 82/1921, 74/2006
<i>Eugenia involucrata</i> DC.	shrub	-			Baitello et al. 2013
<i>Eugenia klotzschiana</i> O.Berg	shrub	-			Baitello et al. 2013
<i>Eugenia puniceifolia</i> (Kunth) DC.	shrub	16C		X	84/1923
<i>Myrcia hebeptala</i> DC.	shrub	-			Baitello et al. 2013
<i>Pimenta pseudocaryophyllus</i> (Gomes) Landrum	shrub	-			Baitello et al. 2013
<i>Psidium firmum</i> O.Berg	shrub	16D		X	83/1922
<i>Psidium grandifolium</i> Mart. ex DC.	shrub	16E		X	297/2155
<i>Psidium guineense</i> Sw.	shrub	-			Baitello et al. 2013
Ochnaceae					
<i>Ouratea floribunda</i> (A.St.-Hil.) Engl.	sub-shrub	16F		X	103/1972, 104/1973, 105/1974, 106/1975



Families/Species	Habit	Figure	Conservation status	Reported by Baitello et al. (2013)	vck/HUFABC/ref.
<b>Orchidaceae</b>					
<i>Cleistis paranaensis</i> (Barb.Rodr.) Schltr.	herb	-			Baitello et al. 2013
<i>Cyrtopodium pallidum</i> Rchb.f. & Warm.	herb	-			Baitello et al. 2013
<i>Epistephium sclerophyllum</i> Lindl.	herb	16G		X	186/2186, 187/2187
<i>Galeandra junceaoides</i> Barb.Rodr.	herb	-			Baitello et al. 2013
<i>Habenaria johannensis</i> Barb.Rodr.	herb	-			Baitello et al. 2013
<i>Habenaria secunda</i> Lindl.	herb	-			Baitello et al. 2013
<i>Pelexia laminate</i> Schltr.	herb	-			Baitello et al. 2013
<b>Orobanchaceae</b>					
<i>Buchnera ternifolia</i> Kunth	herb	16H		X	75/2007, 76/2008
<i>Escobedia grandiflora</i> (L.f.) Kuntze	shrub	-	EN		Baitello et al. 2013
<i>Esterhazyia splendida</i> J.C.Mikan	sub-shrub	17A		X	227/2069, 228/2070
<b>Passifloraceae</b>					
<i>Passiflora clathrata</i> Mast.	sub-shrub	-			Baitello et al. 2013
<b>Pentaphylacaceae</b>					
<i>Ternstroemia brasiliensis</i> Cambess.	shrub	-			Baitello et al. 2013
<b>Poaceae</b>					
<i>Andropogon bicornis</i> L.	herb	17B		X	85/1924
<i>Andropogon lateralis</i> Nees	herb	17C			158/2134
<i>Andropogon leucostachyus</i> Kunth	herb	17D			113/2016, 114/2017
<i>Anthaenantia lanata</i> (Kunth) Benth.	herb	17E		X	1/1875, 13/1879
<i>Aristida jubata</i> (Arechav.) Herter	herb	17F			144/1950
<i>Aristida setifolia</i> Kunth	herb	-			Baitello et al. 2013
<i>Arthropogon villosus</i> Nees	herb	17G			110/1981
<i>Axonopus aureus</i> P. Beauv.	herb	18A			248/2092
<i>Axonopus brasiliensis</i> (Spreng.) Kuhlms.	herb	18B		X	32/1954
<i>Axonopus fissifolius</i> (Raddi) Kuhlms.	herb	-			Baitello et al. 2013
<i>Axonopus marginatus</i> (Trin.) Chase	herb	18C			11/1877
<i>Axonopus pressus</i> (Nees ex Steud.) Parodi	herb	18D		X	250/2094, 251/2095
<i>Axonopus siccus</i> (Nees) Kuhlms.	herb	18E		X	15/1881, 243/2087
<i>Calamagrostis viridiflavescens</i> (Poir.) Steud.	herb	18F			16/1890
<i>Digitaria corynotricha</i> (Hack.) Henrard	herb	-	EN		117/1892
<i>Elionurus muticus</i> (Spreng.) Kuntze	herb	18G		X	10/1876, 14/1880, 7/1886, 8/1887
<i>Eragrostis pilosa</i> (L.) P.Beauv.	herb	-			92/2012, 93/2013
<i>Eragrostis polytricha</i> Nees	herb	-		X	141/1947, 142/1948, 143/1949, 249/2093
<i>Eragrostis secundiflora</i> J. Presl	herb	18H			218/2060
<i>Eriochysis holcoides</i> (Nees) Kuhlms.	herb	-			Baitello et al. 2013
<i>Hyparrhenia rufa</i> (Nees) Stapf	herb	-			308/2170
<i>Imperata tenuis</i> Hack.	herb	-			Baitello et al. 2013
<i>Melinis minutiflora</i> P.Beauv.	herb	-			Baitello et al. 2013
<i>Mesosetum ferrugineum</i> (Trin.) Chase	herb	19A	EN	X	12/1878, 6/1885
<i>Panicum campestre</i> Nees ex Trin.	herb	-		X	28/1904, 244/2088, 245/2089, 246/2090, 247/2091
<i>Panicum rudgei</i> Roem. & Schult.	herb	19B			27/1903
<i>Panicum sellowii</i> Nees	herb	19C			170/2112
<i>Paspalum carinatum</i> Humb. & Bonpl. ex Flügge	herb	-			9/1888
<i>Paspalum cordatum</i> Hack.	herb	-			163/2175, 164/2176
<i>Paspalum erianthum</i> Nees ex Trin.	herb	19D	EN		5/1884
<i>Paspalum eucomum</i> Nees ex Trin.	herb	19E			31/1979, 283/2148
<i>Paspalum filifolium</i> Nees ex Steud.	herb	19F			124/1915, 125/1916, 126/1917
<i>Paspalum hyalinum</i> Nees ex Trin.	herb	-			Baitello et al. 2013
<i>Paspalum maculosum</i> Trin.	herb	-			Baitello et al. 2013
<i>Paspalum notatum</i> Flügge	herb	-			Baitello et al. 2013
<i>Paspalum paniculatum</i> L.	herb	-			Baitello et al. 2013
<i>Paspalum pectinatum</i> Nees ex Trin.	herb	19G			111/1982
<i>Paspalum pilosum</i> Lam.	herb	-			171/2113
<i>Paspalum plicatulum</i> Michx.	herb	-			Baitello et al. 2013
<i>Paspalum polyphyllum</i> Nees	herb	19H			284/2149
<i>Paspalum usteri</i> Hack.	herb	-	EX		4/1889
<i>Schizachyrium condensatum</i> (Kunth) Nees	herb	-		X	216/2058, 217/2059
<i>Schizachyrium sanguineum</i> (Retz.) Alston	herb	-			293/2213
<i>Schizachyrium tenerum</i> Nees	herb	20A	EN		73/2005



Families/Species	Habit	Figure	Conservation status	Reported by Baitello et al. (2013)	vck/HUFABC/ref.
<i>Setaria parviflora</i> (Poir.) Kerguélen	herb	20B		X	26/1902
<i>Sporobolus cubensis</i> Hitchc.	herb	-			2/1882, 3/1883
<i>Trachypogon vestitus</i> Andersson	herb	-			Baitello et al. 2013
<i>Tristachya leiostachya</i> Nees	herb	-			Baitello et al. 2013
<i>Urochloa brizantha</i> (Hochst. Ex A.Rich) R.D.Webster	herb	-			252/2096
Polygalaceae					
<i>Asemeia hirsuta</i> (A.St.-Hil. & Moq.) J.F.B.Pastore & J.R.Abbott	herb	-			Baitello et al. 2013
<i>Monnina richardiana</i> A.St.-Hil. & Moq.	sub-shrub	20C		X	115/1908
<i>Polygala cuspidata</i> DC.	herb	20D		X	21/1897
<i>Polygala poaya</i> Mart.	herb	20E		X	88/1967
<i>Polygala pumila</i> Norlind	herb	20F	EX		86/1932
Primulaceae					
<i>Myrsine coriacea</i> (Sw.) R.Br. ex Roem & Schult	tree	-			309/2153, 310/2154
<i>Myrsine guianensis</i> (Aubl.) Kuntze	tree	-			Baitello et al. 2013
<i>Myrsine umbellata</i> Mart.	tree	-			Baitello et al. 2013
Proteaceae					
<i>Roupala brasiliensis</i> Klotzsch	tree	-			Baitello et al. 2013
Rubiaceae					
<i>Borreria tenella</i> (Kunth) Cham. & Schltdl.	herb	20G			33/1925
<i>Borreria verticillata</i> (L.) G.Mey.	sub-shrub	20H			276/2141
<i>Borreria warmingii</i> K.Schum.	sub-shrub	21A			122/1913, 59/1991, 60/1992
<i>Coccocypselum lanceolatum</i> (Ruiz & Pav.) Pers.	herb	-		X	78/2018
<i>Declieuxia fruticosa</i> (Willd.) Kuntze	herb	-			Baitello et al. 2013
<i>Faramea latifolia</i> (Cham. & Schltdl.) DC.	tree	-			Baitello et al. 2013
<i>Galianthe angustifolia</i> (Cham. & Schltdl.) E.L.Cabral	sub-shrub	21B			22/1898
<i>Galianthe grandifolia</i> E.L.Cabral	sub-shrub	21C			133/1939
<i>Galianthe peruviana</i> (Pers.) E.L.Cabral	herb	-	EX		Baitello et al. 2013
<i>Palicourea rigida</i> Kunth	sub-shrub	21D		X	116/1891
<i>Richardia schumannii</i> W.H.Lewis & R.L.Oliv.	herb	21E	EX		132/1938
<i>Sabicea brasiliensis</i> Wernham	sub-shrub	21F		X	57/1989, 58/1990
Salicaceae					
<i>Casearia sylvestris</i> Sw.	tree	-		X	319/2028
Santalaceae					
<i>Thesium brasiliense</i> A.DC.	sub-shrub	-			Baitello et al. 2013
Sapindaceae					
<i>Dodonaea viscosa</i> Jacq.	shrub	-		X	112/2015
Smilacaceae					
<i>Smilax fluminensis</i> Steud.	vine	21G		X	325/2034
Solanaceae					
<i>Cestrum intermedium</i> Sendtn.	shrub	-			Baitello et al. 2013
<i>Solanum lycocarpum</i> A.St-Hil.	shrub	21H		X	107/1976
<i>Solanum paniculatum</i> L.	shrub	22A			77/2009
<i>Solanum rufescens</i> Sendtn.	shrub	-			Baitello et al. 2013
<i>Solanum sisymbriifolium</i> Lam.	shrub	-			Baitello et al. 2013
<i>Solanum subumbellatum</i> Vell.	shrub	-			Baitello et al. 2013
<i>Solanum variabile</i> Mart.	shrub	-			Baitello et al. 2013
Styracaceae					
<i>Styrax acuminatus</i> Pohl	shrub	-			Baitello et al. 2013
<i>Styrax camporum</i> Pohl	shrub	-			Baitello et al. 2013
<i>Styrax pohlII</i> A.DC.	shrub	-			Baitello et al. 2013
Symplocaceae					
<i>Symplocos laxiflora</i> Benth.	shrub	-			Baitello et al. 2013
<i>Symplocos oblongifolia</i> Casar.	shrub	22B		X	48/1963, 49/1964, 50/1965
<i>Symplocos pubescens</i> Klotzsch ex Benth.	shrub	-			Baitello et al. 2013
<i>Symplocos tetranda</i> (Mart.) Mart.	shrub	-			Baitello et al. 2013
Turneraceae					
<i>Piriqueta aurea</i> (Cambess.) Urb.	herb	22C		X	208/2208
<i>Turnera hilaireana</i> Urb.	herb	22D	EN	X	42/1957
Verbenaceae					
<i>Lantana trifolia</i> L.	shrub	22E			178/2157
<i>Lippia lupulina</i> Cham.	sub-shrub	22F		X	90/2010, 91/2011



Families/Species	Habit	Figure	Conservation status	Reported by Baitello et al. (2013)	vck/HUFABC/ref.
<i>Lippia origanoides</i> Kunth	shrub	22G		X	223/2065, 224/2066, 225/2067, 179/2158, 180/2159
<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	sub-shrub	22H		X	199/2199
<b>Vitaceae</b>					
<i>Cissus erosa</i> Rich.	vine	-			Baitello et al. 2013
<b>Vochysiaceae</b>					
<i>Qualea glaziovii</i> Warm.	tree	-			Baitello et al. 2013
<i>Qualea grandiflora</i> Mart.	tree	-			Baitello et al. 2013
<i>Vochysia cinnamomea</i> Pohl	shrub	-			260/2104, 261/2105

recently burned areas and roadsides of PEJY.

The survey by Baitello et al. (2013) in PEJY found 280 species in open habitats, 79 more than those identified by us. Despite this, only 115 species are common to both surveys. Our research found 86 new species occurring at PEJY that were not listed by Baitello et al. (2013). The new records represent an addition of almost a third of the species richness previously recorded, totaling 366 species found in open habitats of PEJY. The families Poaceae (26 spp.), Asteraceae (24 spp.), Fabaceae (7 spp.), and Rubiaceae (6 spp.) had the most significant increase in numbers of species compared to the list by Baitello et al. (2013). Our survey doubled the list of threatened species of the park, from seven (Baitello et al. 2013) to 14, and found one more potentially invasive species in PEJY.

Of the total species presented here, including those of Baitello et al. (2013), 14 appear in the São Paulo state's Red List of threatened plants (São Paulo 2016) (Table 2). *Hydrocotyle pusilla* A.Rich. (Araliaceae), *Paspalum usteri* Hack. (Poaceae), *Polygala pumila* Norlind (Polygalaceae), and *Richardia schumannii* W.H.Lewis & R.L.Oliv. (Rubiaceae) are considered Presumably Extinct. *Curtia tenuifolia* (Aubl.) Knobl. (Gentianaceae) is listed as Critically Endangered. *Anemopaegma arvense* (Vell.) Stellfeld ex De Souza (Bignoniaceae), *Camarea hirsuta* A.St.-Hil. (Malpighiaceae), *Escobedia grandiflora* (L.f.) Kuntze, (Orobanchaceae), *Digitaria corynotricha* (Hack.) Henrard, *Mesosetum ferrugineum* (Trin.) Chase, *Paspalum erianthum* Nees ex Trin., *Schizachyrium tenerum* Nees (all Poaceae), and *Turnera hilaireana* Urb. (Turneraceae) are Endangered, and *Hippeastrum morelianum* Lem. (Amaryllidaceae) is Vulnerable. Among any of these threatened species, *P. pumila*, *M. ferrugineum*, *S. tenerum*, and *T. hilaireana* seem to have stable populations, as their individuals have been frequently observed in different areas of PEJY. On the other hand, few individuals of *H. pusilla*, *P. usteri*, and *D. corynotricha* were observed in isolated points in the study area, indicating that these populations may be reduced.

We provide short descriptions, vernacular names (when present), comments, and geographic distribution in Brazil for 42 species; these are all threatened species and Poaceae species that we collected in our study.

The cluster analysis of the floristic composition of PEJY revealed three large groups (Fig. 2): (1) with the areas in the countryside of the state of São Paulo (Assis, Itirapina,

Mogi Guaçu, Pedregulho, Pirassununga, Pratânia, and Santa Rita do Passa Quatro), where sandy and deep soils predominate as well as one seasonal subtropical climate (Table 1); (2) areas in MRSP and Paraná (Butantã, Jaraguá, Juquery, and Ponta Grossa), characterized by shallow clayey soils and a humid subtropical climate (Table 1); and (3) the areas in Alto Paraíso and Brasília, which are present in the core region of the Cerrado biome, with deep soils and a typical savanna climate (Table 1). The floristic similarity was observed (Jaccard >25%, Mueller-Dombois and Ellenberg 1974) between PEJY and the grasslands of Butantã (Fig. 2), currently nearly nonexistent in the city of São Paulo. Despite the PEJY and the Jaraguá State Park both being located in the MRSP, our analysis indicated a dissimilarity (Jaccard < 25%) between their flora. The flora of the Cerrado sites in the countryside of São Paulo state was similar to each other but dissimilar to grassland formations of the MRSP, Ponta Grossa, Alto Paraíso, and Brasília (Fig. 2). The cluster analysis by floristic similarity calculated with the Sørensen index did not change the cluster structure substantially.

Araliaceae

***Hydrocotyle pusilla* A.Rich.**

**Identification.** Small prostrate herb, pubescent stem. Characterized by its alternate, simple, peltate, orbicular, and glabrous leaves, with 3–20 mm in diameter. Flowers white, in a 3–10-flowered simple umbel.

**Remarks.** A rare species found at grassland edges near anthropized areas. Considered Presumably Extinct in São Paulo state.

**Brazilian range.** Midwest (MS state), Northeast (BA state), South and Southeast (except ES state) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 2 Oct. 2018; collection number vck324; HUFABC2033.

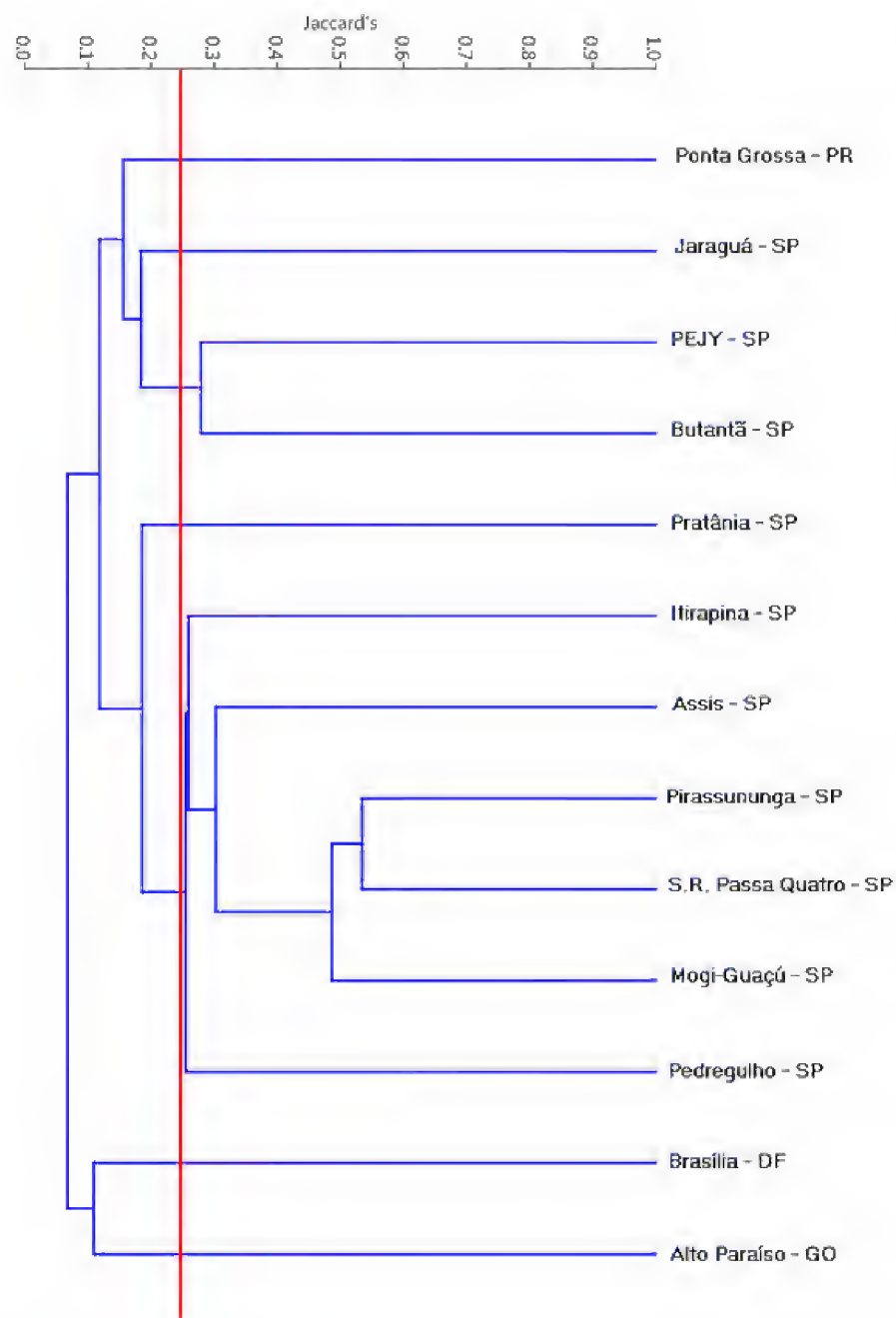
Polygalaceae

***Polygala pumila* Norlind**

Figure 20F

**Identification.** Small prostrate herb, cylindrical stem very branched. Differentiated by its alternate to sub-opposite, sessile or sub-sessile, elliptic-ovate leaves with mucronulate apex, 3.5–7 mm length and 1.5–5 mm wide.





**Figure 2.** UPGMA dendrogram based on Jaccard similarity index to compare the floristic composition of the Parque Estadual do Juquery (PEJY) with other savanna remnants described in Table 1. The red line indicates the 25% similarity threshold (Mueller-Dombois and Ellenberg, 1974).

Green-yellowish flowers in a spike.

**Remarks.** An unusual species, observed in low frequency in the PEJY grasslands and commonly occurring in clusters with other individuals from the same species. Considered Presumably Extinct in São Paulo state and Near Threatened in Brazil.

**Brazilian range.** South and Southeast regions (except ES and RJ states).

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 12 Sep. 2017; collection number vck86; HUFABC1932.

Rubiaceae

*Richardia schumannii* W.H.Lewis & R.L.Oliv.

Figure 21E

**Identification.** Small prostrate herb, with a short and hirsute stem. Stipulate sheath significantly reduced. Identified by its simple, opposite, lanceolate to narrowly ovate leaves with hirsute abaxial indumenta, 11 mm long and 5 mm wide. Glomerule with 1–4 white flowers.

**Remarks.** A rare species observed sparsely occurring in native grassland, near other individuals from the same

species. Considered Presumably Extinct in São Paulo state, and Endangered in Brazil.

**Brazilian range.** South (PR state) and Southeast (except ES and RJ states) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 13 Dec. 2017; collection number vck132; HUFABC1938.

Turneraceae

*Turnera hilaireana* Urb.

Figure 22D

**Identification.** Erect herb, 3–17 cm height, with simple and glandular hairs. Distinguished by its alternate, simple, elliptical, obovate, or ovate leaves with discoidal, extrafloral nectaries, simple hairs on both sides, 7–28 mm long, and 4–15 mm wide. Flower yellow, axillary.

**Remarks.** A rare species, occurring sparsely in the native grassland. Considered Endangered in São Paulo state.

**Brazilian range.** Midwest (except MS and MT states), South (PR state) and Southeast (except ES and RJ states) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°21'05"S, 046°41'48"W; 15 Aug. 2017; collection number vck42; HUFABC1957.

Poaceae

*Andropogon bicornis* L.

Figure 17B

**Identification.** Perennial tussock grass, 0.6–1.8 m height. Leaf-blades linear, 23–60 cm long, 0.2–0.6 mm wide, usually hairy at the abaxial side, ligulate. Characteristic for its branched, contracted corymbiform inflorescence, with soft white hairs.

**Common name.** Capim-rabo-de-burro; Capim-vassoura

**Remarks.** Common species, occurring on roadsides and places with seasonal flooding.

**Brazilian range.** All Brazilian territory.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'11"S, 046°42'07"W; 8 Sep. 2017; collection number vck85; HUFABC1924.

*Andropogon lateralis* Nees

Figure 17C

**Identification.** Perennial tussock grass, 0.40–1.75 m height. Leaf-blades linear, glabrous or hairy, 7–35 cm long and 0.2–0.4 cm wide, ligulate. It is identified by its inflorescence with 2–10 flower branches conjugated or sub-digitate, 3.5–6.0 cm long, pilose, with aristulate spikelets.

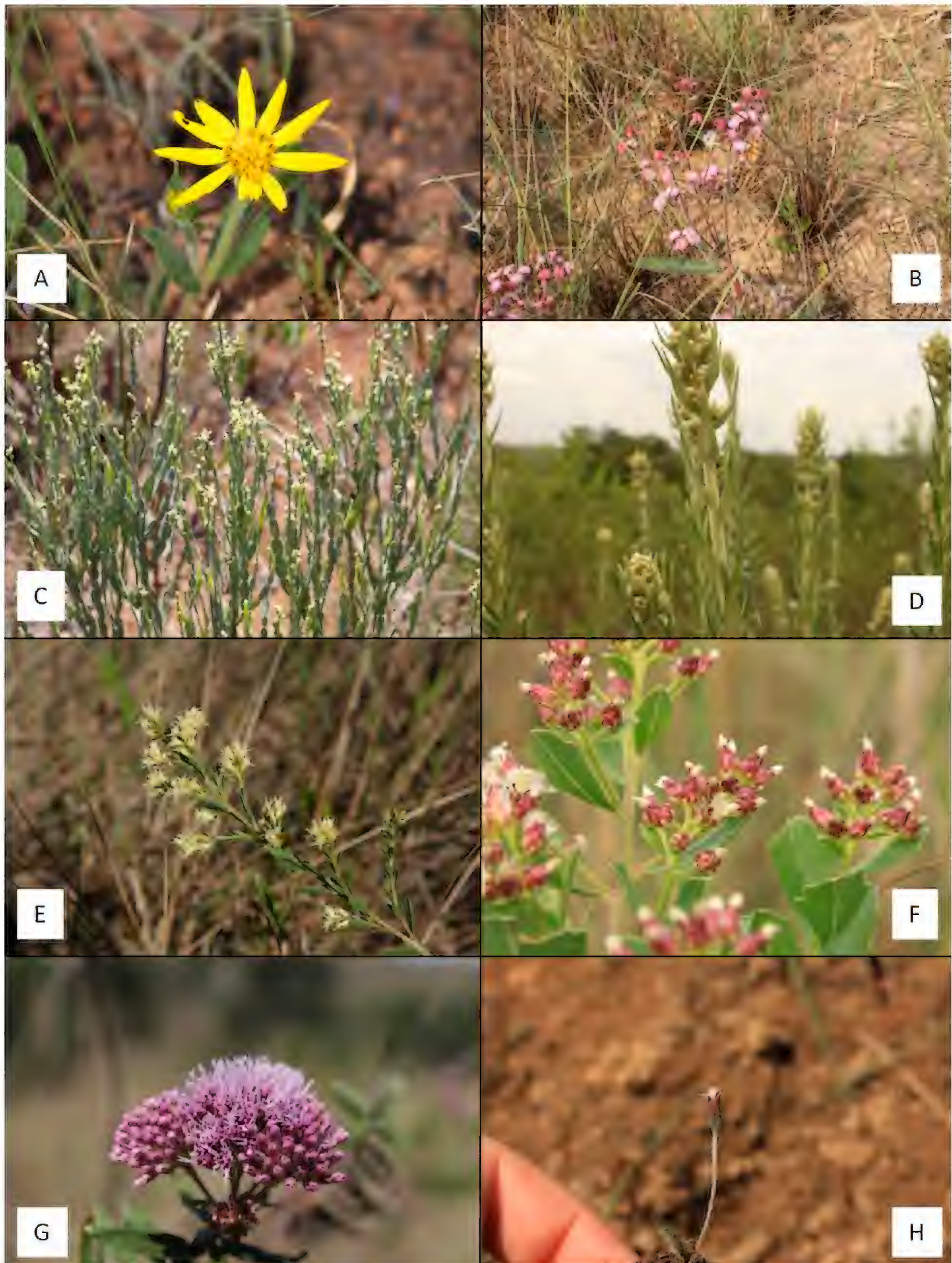
**Remarks.** Unusual grass, occurring mainly on sites with high moisture.





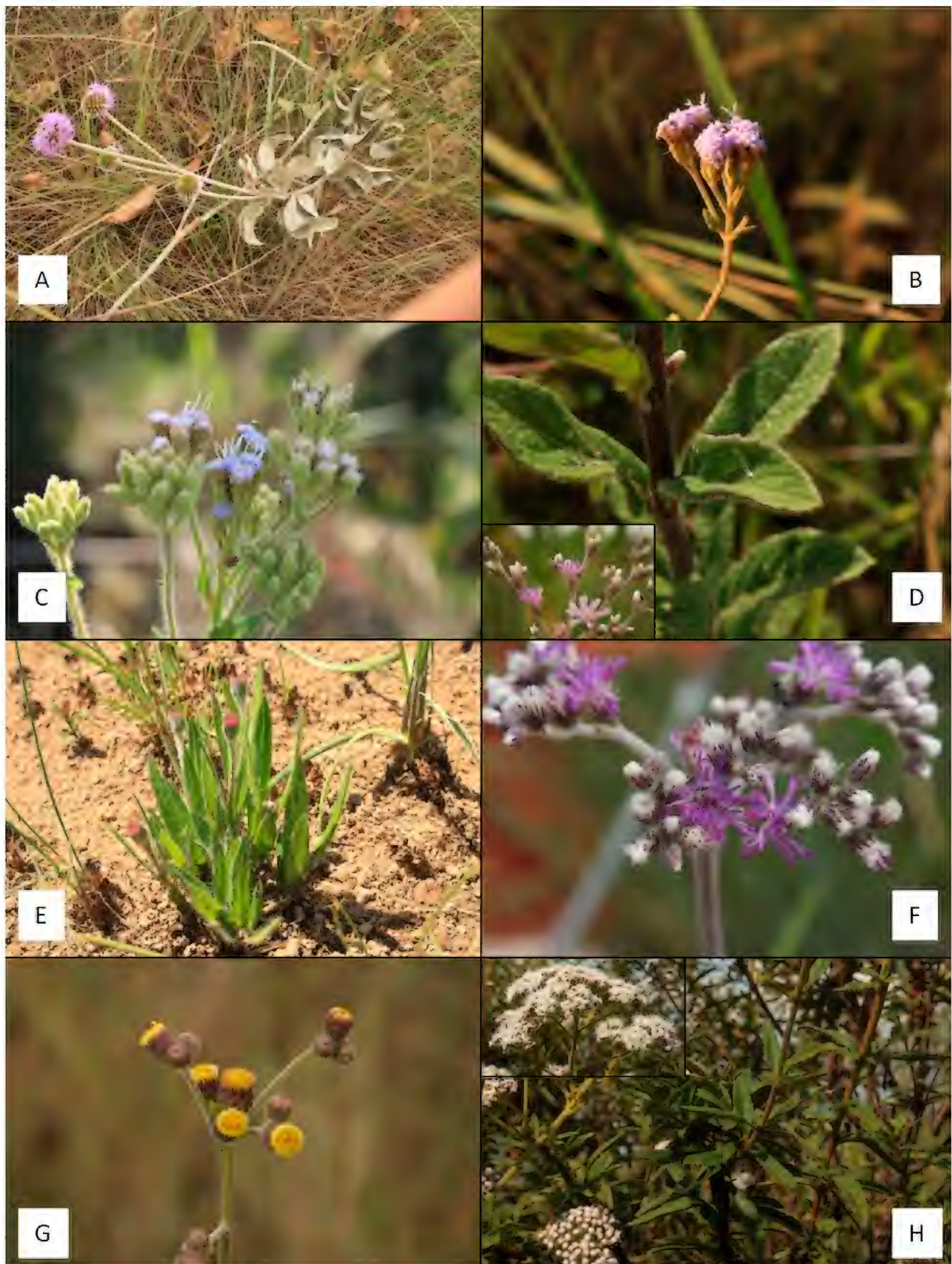
**Figure 3.** ACANTHACEAE **A.** *Ruelia geminiflora*. ANNONACEAE **B.** *Duguetia furfuracea*. APIACEAE **C.** *Eryngium pristis*. APOCYNACEAE **D.** *Mandevilla velame*, flower in detail. **E.** *Oxypetalum erectum*. ARALIACEAE **F.** *Didymopanax macrocarpus*. ARISTOLOCHIACEAE **G.** *Aristolochia labiata*, flower in detail. ASTERACEAE **H.** *Aldama robusta*.





**Figure 4.** ASTERACEAE **A.** *Aspilia foliacea*. **B.** *Ayapana amygdalina*. **C.** *Baccharis articulata*. **D.** *B. helichrysoides*. **E.** *B. subdentata*. **F.** *B. cognata*. **G.** *Campovassouria cruciata*. **H.** *Chaptalia mandonii*.





**Figure 5.** ASTERACEAE **A.** *Chresta sphaerocephala*. **B.** *Chromolaena congesta*. **C.** *C. hirsuta*. **D.** *Chrysolaena cognata*, inflorescence in detail. **E.** *C. desertorum*. **F.** *C. obovata*. **G.** *Conyza primulifolia*. **H.** *Grazielia intermedia*, inflorescence in detail.



**Brazilian range.** Midwest, North (AM state), Northeast (MA state), South and Southeast (except ES state) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'17"S, 046°41'40"W; 10 Jan. 2018; collection number vck158; HUFABC2134.

*Andropogon leucostachyus* Kunth

Figure 17D

**Identification.** Perennial tussock grass, 0.25–1.05 m height. Leaf-blades linear, glabrous, or scabrous on both sides, 5–40 cm long and 0.1–0.3 cm wide, ligulate. Distinguished by its inflorescence with 2–7 branches conjugated or digitated, 2.5–5.0 cm long, densely covered with white, silky hair.

**Common name.** Campim-colchão; Capim-membeca

**Remarks.** A common species on roadsides and disturbed sites.

**Brazilian range.** All Brazilian regions.

**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'11"S, 046°42'07"W; 27 Oct. 2017; collection number vck113; HUFABC2016 • same collection data as for preceding; collection number vck114, HUFABC2017.

*Anthaenantia lanata* (Kunth) Benth.

Figure 17E

**Identification.** Perennial tussock grass, 0.15–1.1 m height. Characterized by its leaf-blades glabrous, or sometimes hairy, plane and convolute, 7–60 cm long and 0.1–0.5 cm wide, with a clear and conspicuous central vein. Spikelets in a typical panicle, 8–20 cm long, with scattered hairs.

**Common name.** Capim-prateado; Capim-zaranza

**Remarks.** A common species frequently observed on PEJY's native grassland and also occurring on disturbed sites.

**Brazilian range.** Midwest, North (except AC state), Northeast (except AL, RN and SE states), South and Southeast (except ES and RJ states) regions.

**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 4 Aug. 2016; collection number vck1; HUFABC1875 • same collection data as for preceding; 4 Nov. 2016; collection number vck13; HUFABC1879.

*Aristida jubata* (Arechav.) Herter

Figure 17F

**Identification.** Perennial tussock grass, 40–80 cm height. Leaf-blades glabrous or scabrous, conduplicate, filiform, 15–25 (40) cm long and 0.05–0.1 cm wide, ligulate. Identified by its open panicle, 20–30 cm long, and by its spikelets with three straight, subequal awns, 17–22 cm long.

**Common name.** Capim-barba-de-bode

**Remarks.** An unusual species on the native grassland but frequently observed occupying and colonizing disturbed sites.

**Brazilian range.** Midwest (except GO state), South and Southeast (except ES state) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 13 Dec. 2017; collection number vck144; HUFABC1950.

*Arthropogon villosus* Nees

Figure 17G

**Identification.** Perennial tussock grass, 40–90 cm height. Leaf-blades linear, glabrous or hirsute, 12–20 cm long, 0.6–0.8 cm wide, ligulate. Distinguished by its open panicle, 7–10 cm long, containing hairy spikelets with apical awn 3.5–5.0 mm long.

**Remarks.** An unusual species on the native grassland, occurring mainly over the shallow and rocky soil.

**Brazilian range.** Midwest, North (PA state), Northeast (BA and CE states), South (PR state) and Southeast (except ES and RJ states) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'17"S, 046°41'40"W; 21 Oct. 2017; collection number vck110; HUFABC1981.

*Axonopus aureus* P. Beauv.

Figure 18A

**Identification.** Perennial tussock grass with short rhizomes, 30–70 cm height. Leaf-blades linear, apex acute, 6–15 cm long and 0.2–0.3 cm wide. It is recognized by its inflorescence with 2–7 sub-digitate racemes, 5–9 cm long, covered with golden trichomes.

**Remarks.** Species with individuals in small clusters scattered across the native grassland, mainly over the shallow and rocky soils.

**Brazilian range.** Midwest, North, Northeast (except AL, CE, PI and RN states), South, and Southeast regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'33"S, 046°40'42"W; 6 Mar. 2018; collection number vck248; HUFABC2092.

*Axonopus brasiliensis* (Spreng.) Kuhlman

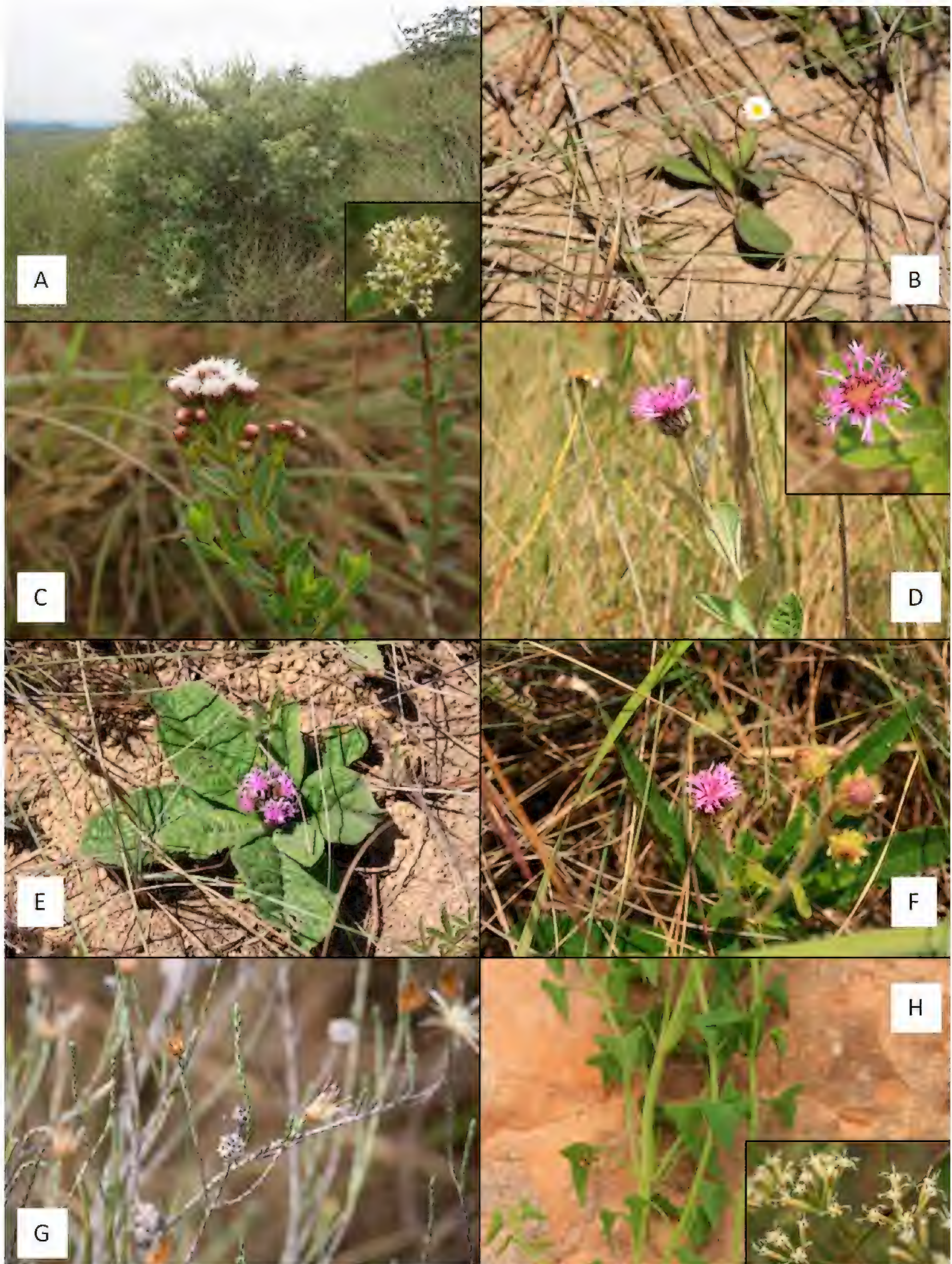
Figure 18B

**Identification.** Perennial tussock grass with short rhizomes, 26–70 cm height. Leaf-blades linear, glabrous or sparsely hirsute, apex sub-acute, 8–18 cm long, 0.1–0.3 cm wide, ligulate. It can be distinguished by its inflorescence with 2–6 digitate branches, 4–6 cm long, hirsute with white papillose trichomes.

**Remarks.** A common species on native grassland.

**Brazilian range.** Midwest, North (AM, RO and TO states), Northeast (BA and MA states), South and Southeast regions.





**Figure 6.** ASTERACEAE **A.** *Hoehnephytum trixoides*, inflorescence in detail. **B.** *Inulopsis capose*. **C.** *Koanophyllon myrtilloides*. **D.** *Lessingianthus argyrophyllus*, inflorescence in detail. **E.** *L. cephalotes*. **F.** *L. argyrophyllus*. **G.** *Lucilia lycopodioides*. **H.** *Mikania officinalis*, inflorescence in detail.





**Figure 7.** ASTERACEAE **A.** *Lessingianthus roseus*. **B.** *L. virgulatus*, inflorescence in detail. **C.** *Mikania sessilifolia*. **D.** *Tilesia baccata*. BIGNONIA-  
CEAE **E.** *Adenocalymma pedunculatum*, flowers in detail. **F.** *Fridericia platyphylla*, flowers in detail.





**Figure 8.** BIGNONIACEAE **A.** *Jacaranda oxyphylla*, flower in detail. **B.** *Zeyheria montana*, flower and fruit in detail. BORAGINACEAE **C.** *Varroa calocephala*. BROMELIACEAE **D.** *Dickya tuberosa*, inflorescence in detail. CALOPHYLLACEAE **E.** *Kielmeyera pumila*, flower in detail. CAMPANULACEAE **F.** *Lobelia camporum*. **G.** *Wahlenbergia brasiliensis*. CELASTRACEAE **H.** *Peritassa campestris*, flower and fruit on detail.



**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 15 May. 2017; collection number vck32; HUFABC1954.

*Axonopus marginatus* (Trin.) Chase

Figure 18C

**Identification.** Perennial tussock grass, 30–60 cm height. Leaf-blades linear, apex sub-acute, densely covered with hairs, 6–30 cm long, 0.2–0.8 cm wide. Characterized by its inflorescence with 2–11 sub-digitate branches, 4–11 cm long, concentrated on the apex and covered with silvery, yellowish, or brown trichomes.

**Remarks.** A unusual species in the native grassland.

**Brazilian range.** Midwest, North (except AC and AP states), Northeast, South (except RS state) and Southeast regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'17"S, 046°41'40"W; 4 Nov. 2016; collection number vck11; HUFABC1877.

*Axonopus pressus* (Nees ex Steud.) Parodi

Figure 18D

**Identification.** Perennial tussock grass with conspicuous rhizomes, 0.7–1.5 m height. Identified by its leaf-blades linear-lanceolate, plain or conduplicate, obtuse apex, glabrous to densely covered with hairs, 20–35 cm long, 0.5–1.0 cm wide, sometimes presenting a bluish coloration. Inflorescence with 9–25 alternate branches, 5–25 cm long.

**Remarks.** A common species on the native grassland, occurring isolated or in small clusters.

**Brazilian range.** Midwest, North (PA and TO states), Northeast (BA, MA and RN states), South (except SC state) and Southeast (except RJ state) regions.

**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'33"S, 046°40'42"W; 6 Mar. 2018; collection number vck250; HUFABC2094 • same collection as for preceding; collection number vck251; HUFABC 2095.

*Axonopus siccus* (Nees) Kuhlman

Figure 18E

**Identification.** Perennial tussock grass, 0.25–1.0 m height. Distinguished by its leaf-blades filiform, convolute to cylindrical, 5–60 cm long, 0.1–0.7 cm wide, with acuminate apex, glabrous to densely covered with hairs. Inflorescence with 2–25 alternate branches, 5–15 cm long.

**Remarks.** Prevalent species on the native grassland.

**Brazilian range.** Midwest, North (except AP and RR states), Northeast (except CE, PB and RN states), South (except RS state) and Southeast regions.

**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 4 Nov. 2016; collection number vck15;

HUFABC1881 • Franco da Rocha, Parque Estadual do Juquery; 23°20'33"S, 046°40'42"W; 6 Mar. 2018; collection number vck243; HUFABC2087.

*Calamagrostis viridiflavescens* (Poir.) Steud.

Figure 18F

**Identification.** Perennial tussock grass, with short rhizomes, 0.5–1.1 m height. Leaf-blades linear, glabrous, 10–30 cm long, 0.5–1.0 cm wide, ligulate. Identified by its green-yellowish contracted panicle inflorescence, 17–34 cm long.

**Remarks.** An unusual species on the native grassland, observed mainly in places with little disturbance.

**Brazilian range.** South and Southeast regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 19 Nov. 2016; collection number vck16; HUFABC1890.

*Digitaria corynotricha* (Hack.) Henrard

**Identification.** Perennial tussock grass, 50–80 cm height. Leaf-blade lanceolate, with trichome in both faces, 8–14 cm long, 0.4 cm wide, ligulate. It is recognized by its inflorescence with 1–2 erect branches, 10–15 cm long, spikelets with dark-brown hairs.

**Remarks.** A rare species on the native grassland. Considered Endangered in São Paulo state.

**Brazilian range.** Midwest, North (PA state), Northeast (BA state), South (except SC state) and Southeast (except ES and RJ states) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 2 Dec. 2017; collection number vck117; HUFABC1892.

*Elionurus muticus* (Spreng.) Kuntze

Figure 18G

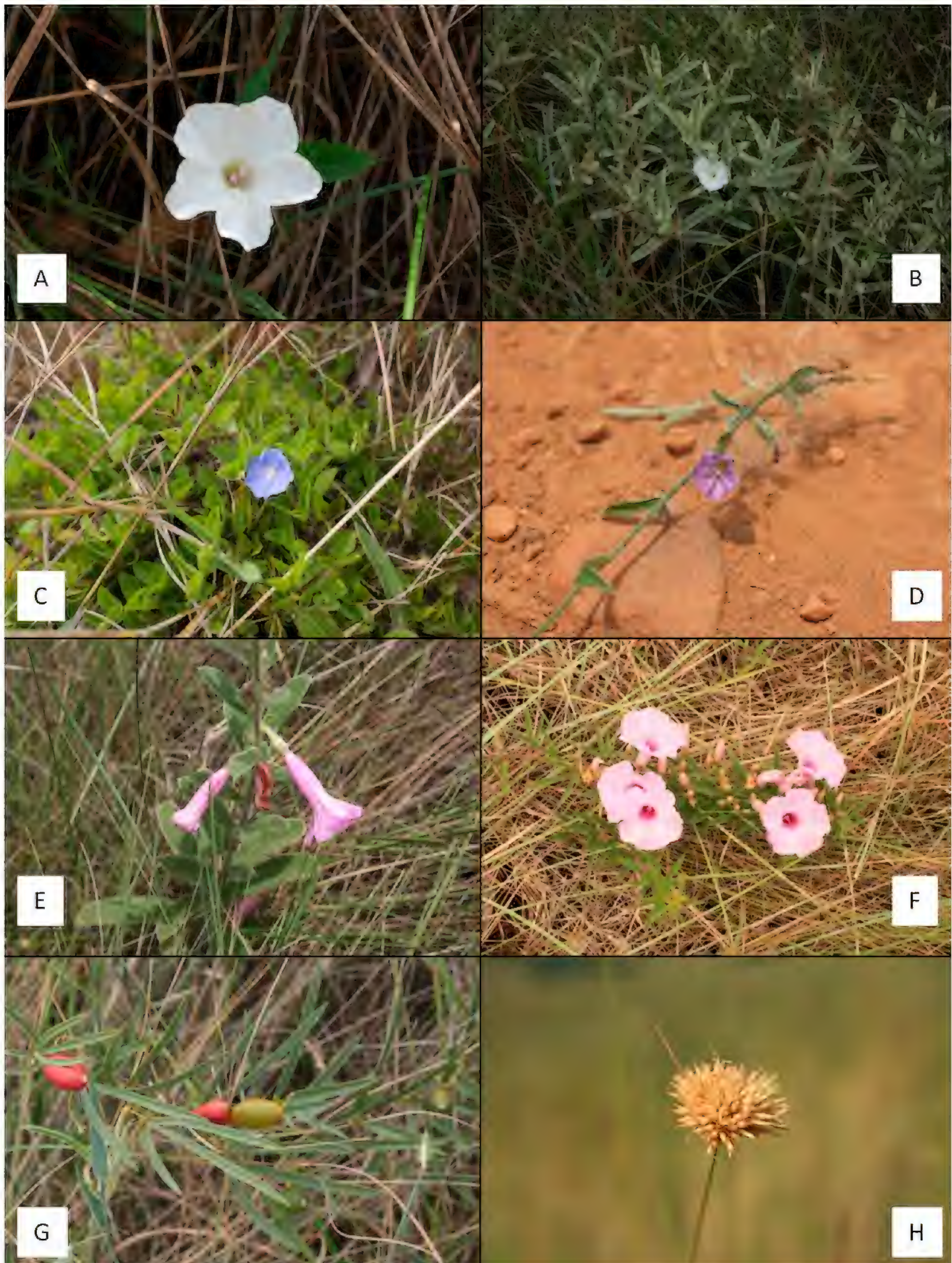
**Identification.** Perennial tussock grass, with short rhizomes, 50–90 cm height. Distinguished by its leaf-blades filiform, involute, and hairy, 8–30 cm long, 0.1–0.14 cm wide, with a characteristic lemon odor when smashed. Inflorescence with a solitary branch, 3.0–6.5 cm long, with white-silvery trichomes.

**Remarks.** Prevalent species on the native grassland.

**Brazilian range.** Midwest, North (PA and RR states), Northeast (BA state), South (PR state) and Southeast (except ES and RJ states) regions.

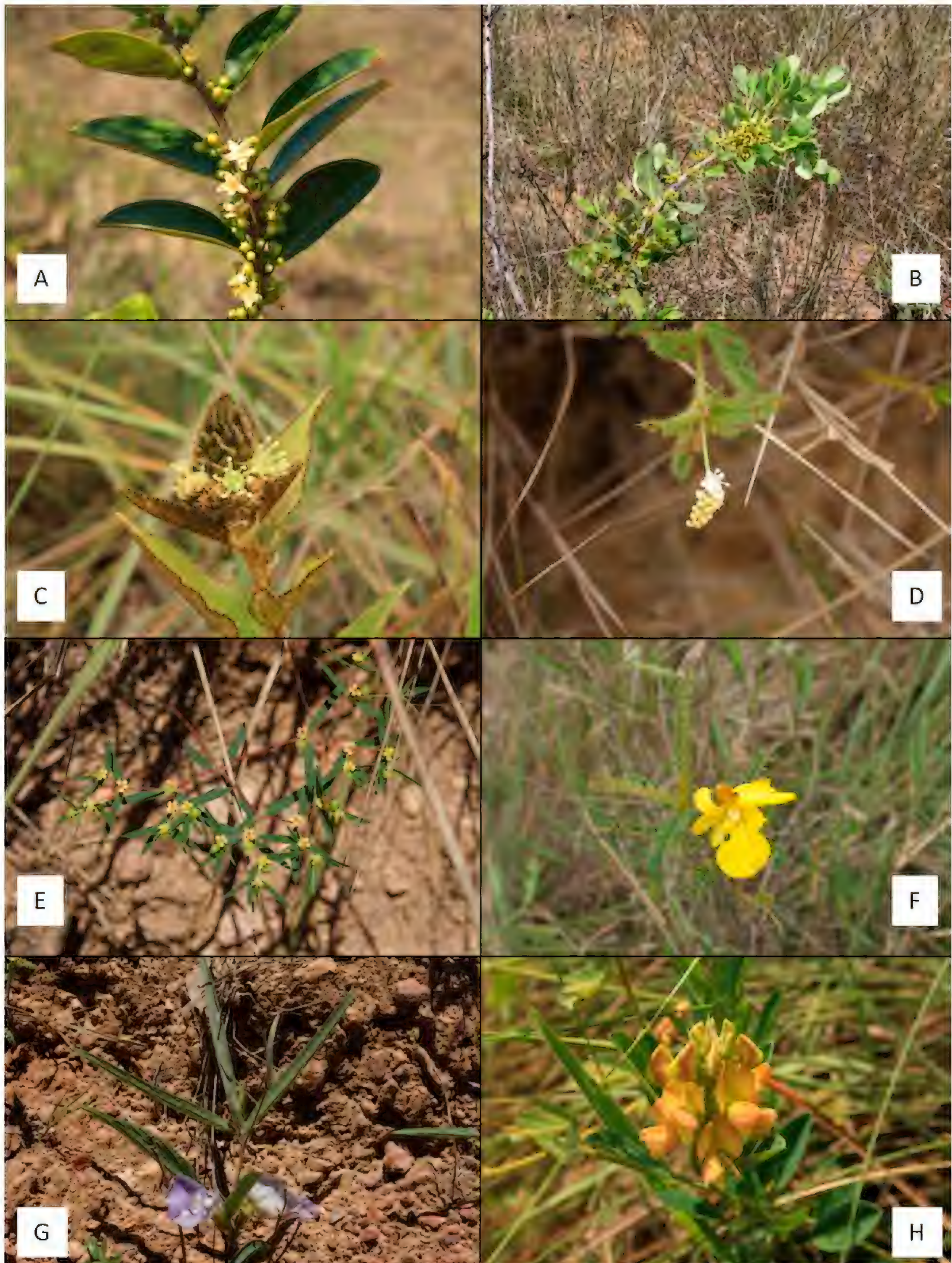
**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'56"S, 046°42'11"W; 4 Nov. 2016; collection number vck7; HUFABC1886 • same collection data as for preceding; collection number vck8; HUFABC1887 • same collection data as for preceding; collection number vck10; HUFABC1876 • same collection data as for preceding; collection number vck14; HUFABC1880.





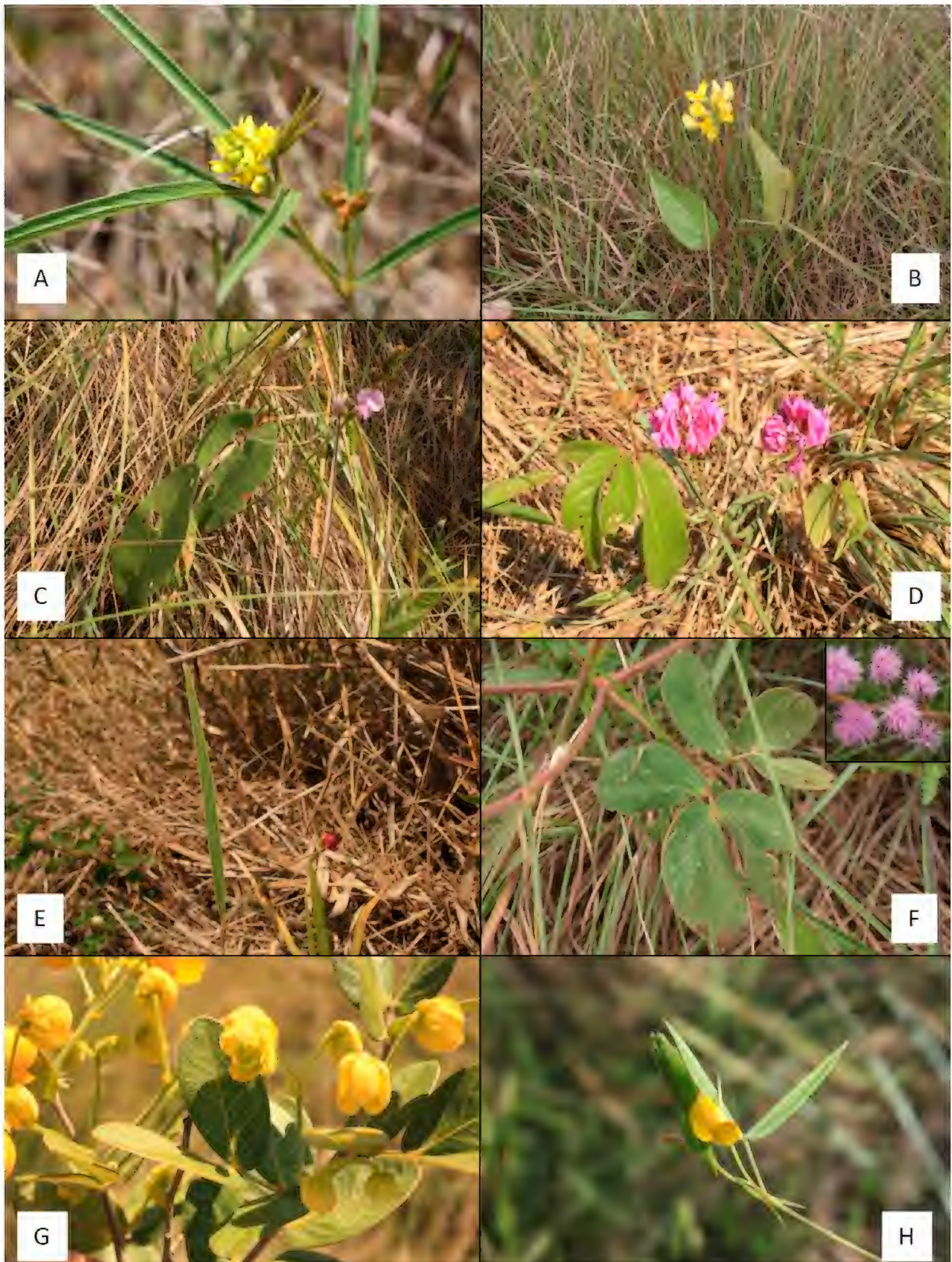
**Figure 9.** CONVULVULACEAE **A.** *Distimake hisrutus*. **B.** *D. tomentosus*. **C.** *Evolvulus macroblepharis*. **D.** *E. sericeus*. **E.** *Ipomoea argentea*. **F.** *I. delphinioides*. CUCURBITACEAE **G.** *Cayaponia espelina*. CYPERACEAE **H.** *Rhynchospora globosa*.





**Figure 10.** ERYTHROXYLACEAE **A.** *Erythroxylum campestre*. **B.** *E. suberosum*. EUPHORBIACEAE **C.** *Croton didrichsenii*. **D.** *C. lundianus*. **E.** *Euphorbia potentilloides*. FABACEAE **F.** *Chamaecrista cathartica*. **G.** *Clitoria guianensis*. **H.** *Crotalaria unifoliolata*.





**Figure 11.** FABACEAE **A.** *Eriosema crinitum*. **B.** *E. heterophyllum*. **C.** *Cerradicola decumbens*. **D.** *Bettencourtia martii*. **E.** *Nanogalactia pretiosa*. **F.** *Mimosa debilis*, flowers in detail. **G.** *Senna rugosa*. **H.** *Zornia reticulata*.



***Eragrostis pilosa* (L.) P.Beauv.**

**Identification.** Annual tussock grass, 54–85 cm height. Leaf-blades lanceolate, glabrous, without glandules, 4.5–23.0 cm long, 0.1–0.5 cm wide, ligulate. Characterized by its open panicle, 8–24 cm long, 2–5–8 cm wide, with hairs on the axil.

**Common name.** Capim-peludo; Capim-orvalho.

**Remarks.** Species uncommon on the native grassland, occurring mainly on disturbed sites.

**Brazilian range.** Midwest, North (AP, PA and RR states), Northeast (except SE state), South, and Southeast regions.

**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'53"S, 046°42'17"W; 26 Sep. 2017; collection number vck92; HUFABC2012 • same collection data as for preceding; collection number vck 93; HUFABC2013.

***Eragrostis polytricha* Nees**

**Identification.** Perennial tussock grass, 20–75 cm height. Leaf-blades linear, without glandules, trichomes densely present on both sides, 9–28 cm long, 0.23–0.5 cm wide, ligulate. It is identified by its open panicle, 15–29 cm long, 14–23 cm wide, with trichomes present along the main axis and at the axils.

**Common name.** Palha-voadora

**Remarks.** A common species at the native grassland.

**Brazilian range.** Midwest, North (RR state), Northeast (BA, PB and PE states), South and Southeast (except RJ state) regions.

**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 13 Dec. 2017; collection number vck141; HUFABC1947 • same collection data as for preceding; collection number vck142; HUFABC1948 • same collection data as for preceding; collection number vck143; HUFABC1949 • Franco da Rocha, Parque Estadual do Juquery; 23°20'33"S, 046°40'42"W; 6 Mar. 2018; collection number vck249; HUFABC2093.

***Eragrostis secundiflora* J. Presl**

Figure 18H

**Identification.** Perennial tussock grass, 50–70 cm height. Leaf-blades with trichomes on the abaxial face, 7–16 cm long, 0.3–0.45 cm wide, without glandules, ligulate. Recognized by its dense, contracted panicle, 4.5–11.5 cm long, axils with hairs, spikelets densely grouped, and green to purplish.

**Remarks.** Uncommon species on the native grassland, more often occupying disturbed places.

**Brazilian range.** Midwest, North (PA and RR states), Northeast (except CE and SE states) and Southeast (except MG and RJ states) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'30"S, 046°40' 36"W; 5 Mar. 2018; collection number vck218;

HUFABC2060.

***Hyparrhenia rufa* (Nees) Stapf**

**Identification.** Perennial tussock grass, 1–2 m height. Leaf-blades linear, scabrous, 35–50 cm long, 0.4–0.6 cm wide, ligulate. Distinguished by its open panicle, 25–35 cm long, with hairy spikelets containing a 15–26 mm long awn.

**Common name.** Capim-jaraguá

**Remarks.** African grass with invasive potential. Widespread on some disturbed sites, not occurring on the native grassland.

**Brazilian range.** Midwest, North (except AC and AP states), Northeast (except AL and RN states), South and Southeast regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'17"S, 046°42'19"W; 15 Jun. 2018; collection number vck308; HUFABC2170.

***Mesosetum ferrugineum* (Trin.) Chase**

Figure 19A

**Identification.** Perennial tussock grass, 30–70 cm height. Leaf-blades linear to linear-lanceolate, hairy on both sides, 8–24 cm long, 0.15–3.0 cm wide, ligulate. Characterized by its inflorescence with a single branch, 5–10 cm long, with spikelets covered with ferruginous trichomes.

**Remarks.** Less frequent species, occurring sparsely on the native grassland on dry soils. Considered Endangered in São Paulo state.

**Brazilian range.** Midwest (except MS state), Northeast (BA state), South (PR state) and Southeast (except ES and RJ states) regions.

**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'17"S, 046°41'40"W; 4 Nov. 2016; collection number vck6; HUFABC1885 • same collection data as for preceding; collection number vck12; HUFABC1878.

***Panicum campestre* Nees ex Trin.**

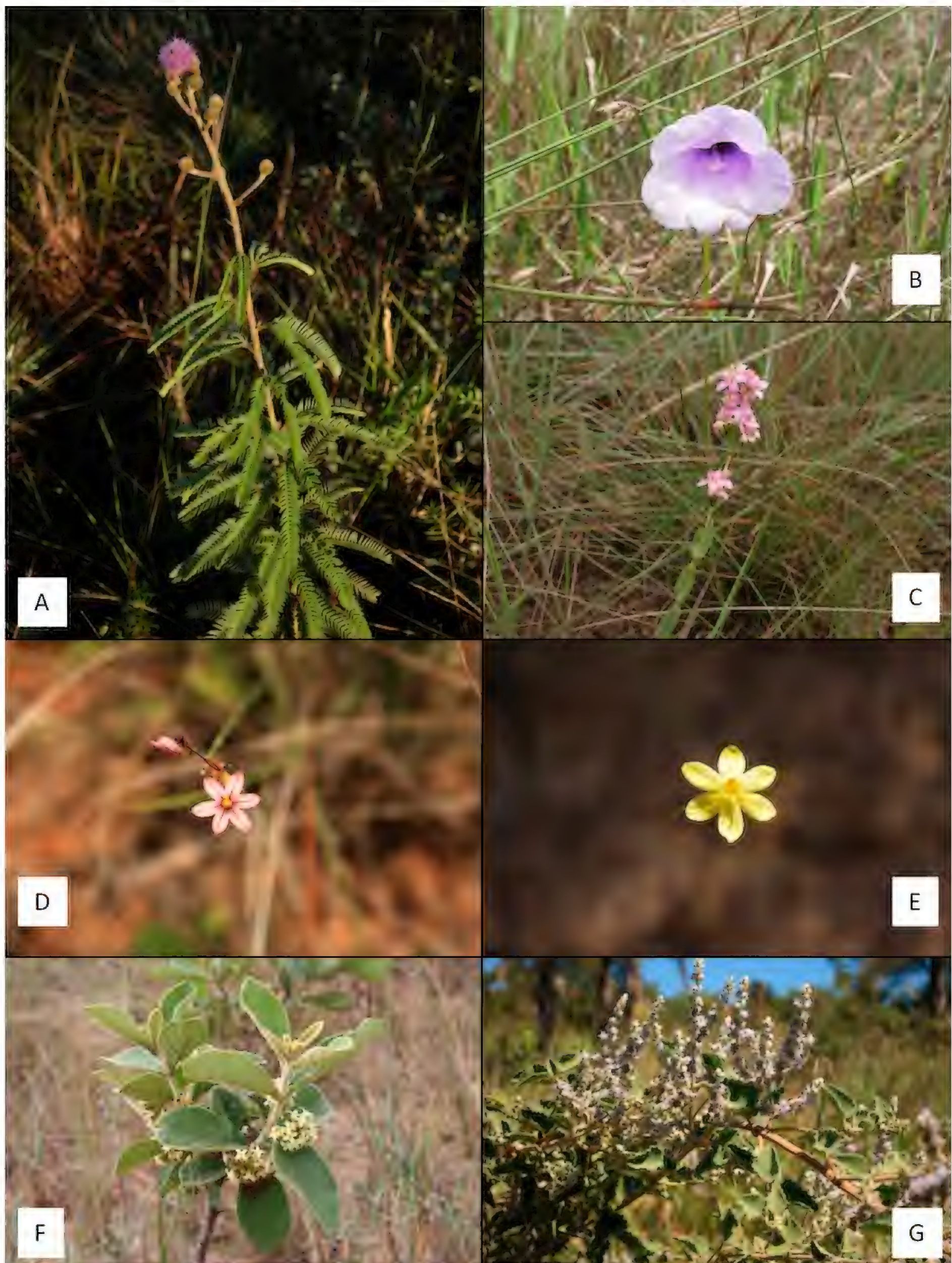
**Identification.** Perennial tussock grasses, sometimes decumbent, 26–95 cm height. Leaf-blades linear-lanceolate, acuminate, round to sub-cordate base, 8–22 cm long, 0.3–0.8 cm wide, sparsely to densely hairy, ligulate. Diagnosed by its typical panicle, 9.5–20.0 cm long, with trichomes on the rachis, solitary spikelets, rounded and sparsely hairy.

**Remarks.** An unusual species, occurring scattered on the native grassland.

**Brazilian range.** Midwest, North (AM and PA states), Northeast (BA and PE states), South (PR state) and Southeast (except ES state) regions.

**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 2 Feb. 2017; collection number vck28;





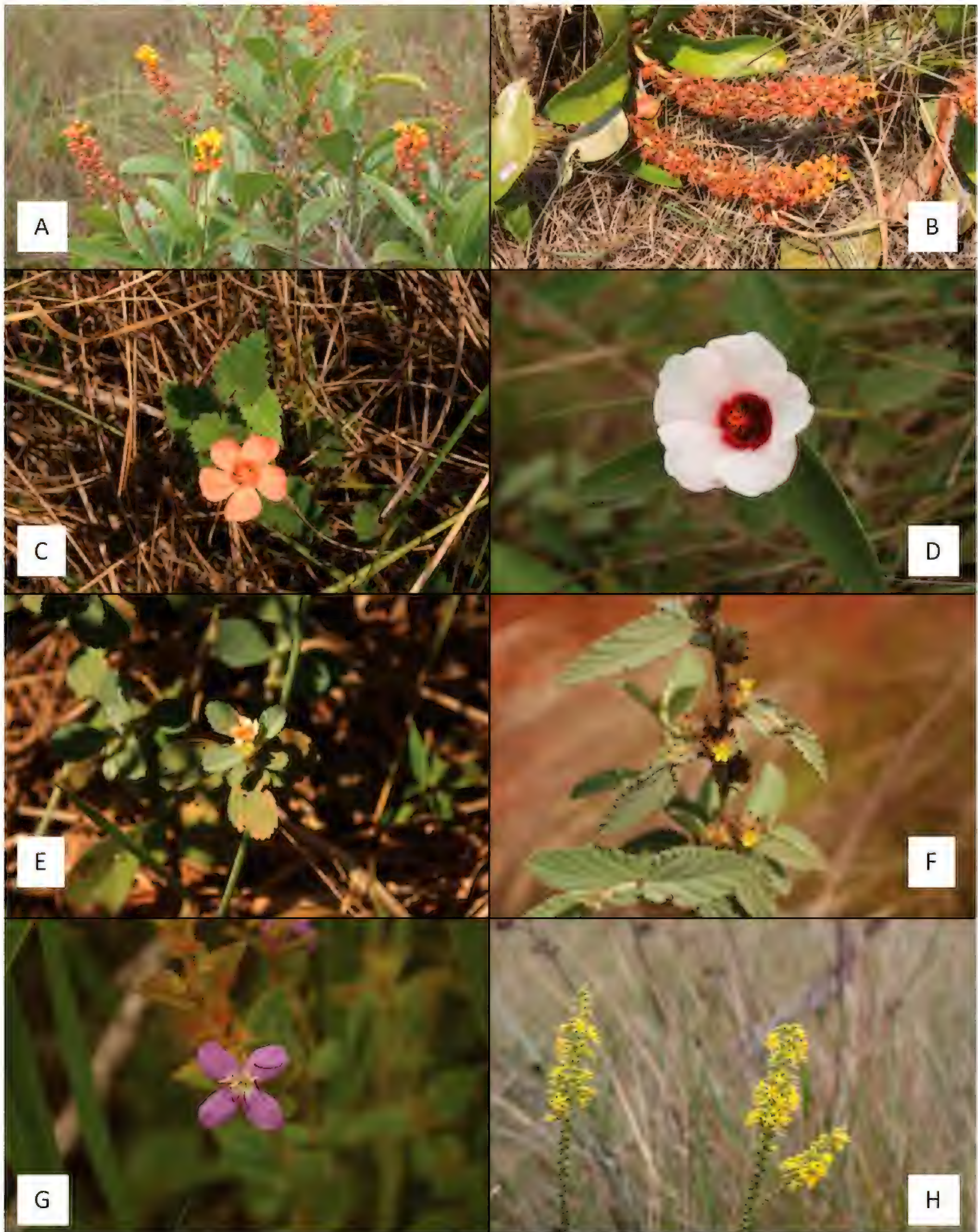
**Figure 12.** FABACEAE **A.** *Mimosa dolens* var. *acerba*. GENTIANACEAE **B.** *Calolisianthus amplissimus*. **C.** *Deianira nervosa*. IRIDACEAE **D.** *Sisyrinchium purpurellum*. **E.** *S. restioides*. LAMIACEAE **F.** *Aegiphila verticillata*. **G.** *Cantinoa althaeifolia*.





**Figure 13.** LAMIACEAE **A.** *Cantinoa plectranthoides*. **B.** *Eriope crassipes*, flowers in detail. **C.** *Hyptis nudicaulis*, inflorescence in detail. **D.** *Medusantha crinita*. **E.** *Rhabdocaulon denudatum*. **F.** *Salvia minarum*, flowers in detail. MALPIGHIACEAE **G.** *Banisteriopsis campestris* flowers in detail. **H.** *Byrsonima guilleminiana*.





**Figure 14.** MALPIGHIACEAE **A.** *Byrsonima intermedia*. **B.** *B. subterranea*. MALVACEAE **C.** *Krapovickasia macrodon*. **D.** *Peltaea polymorpha*. **E.** *Sida glaziovii*. **F.** *Waltheria indica*. MELASTOMATACEAE **G.** *Acisanthera variabilis*. **H.** *Cambessedesia espora*.



HUFABC1904 • Franco da Rocha, Parque Estadual do Juquery; 23°20'33"S, 046°40'42"W; 6 Mar. 2018; collection number vck244; HUFABC2088 • same collection data as for preceding; collection number vck245; HUFABC2089 • same collection data as for preceding; collection number vck246; HUFABC2090 • same collection data as for preceding; collection number vck247; HUFABC2091.

***Panicum rudgei* Roem. & Schult.**

Figure 19B

**Identification.** Perennial decumbent, rhizomatous grass, 50–90 cm height. Leaf-blades linear-lanceolate acuminate, densely covered with hairs on both sides, 16–36 cm long, 0.6–1.1 cm wide, ligulate. It is identified by its typical panicle, 13–45 cm long, with hairs on the axile and glabrous spikelets.

**Common name.** Navalinha, Capim-mirião

**Remarks.** A uncommon species, occurring sparsely on the native grassland.

**Brazilian range.** Midwest, North (except TO state), Northeast (except MA, PI, RN and SE states), South (PR state) and Southeast regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 2 Feb. 2017; collection number vck27; HUFABC1903.

***Panicum sellowii* Nees**

Figure 19C

**Identification.** Perennial grass with short rhizomes, 0.35–1.0 m height. Leaf-blades lanceolate, leaf base subcordate, slightly asymmetric, glabrous, or with trichomes on both sides, ligulate. It is identified by its typical panicle inflorescence, 3–19 cm long, with green spikelets.

**Remarks.** Unusual species, with few individuals observed on the native grassland.

**Brazilian range.** All Brazilian regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°21'04"S, 046°42'04"W; 7 Feb. 2018; collection number vck170; HUFABC2112.

***Paspalum carinatum* Humb. & Bonpl. ex Flügge**

**Identification.** Perennial tussock grass, 25–70 cm height. Leaf-blades filiform, convolute, with long trichomes at the abaxial side, 3–30 cm long, 0.1–0.5 cm wide, ligulate. It is diagnosed by its single branch inflorescence, 4–11 cm long, winged rachis, partially covering the spikelets.

**Remarks.** A common species, observed sparsely amongst the native grassland.

**Brazilian range.** Midwest, North (except AC, AM and RO states), Northeast (BA, MA and RN states), South (except RS state), Southeast (except ES and RJ states) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'34"S,

046°42'21"W; 4 Nov. 2016; collection number vck9; HUFABC1888.

***Paspalum cordatum* Hack.**

**Identification.** Perennial tussock grass, short rhizomes, 1.00–1.65 m height. Leaf-blades linear, 6.5–40.0 cm long, 0.4–0.7 cm wide, acuminate, glabrous to densely hairy on both sides, ligulate. It is characterized by its inflorescence with 3–10 alternate branches, with solitary and cordiform spikelets.

**Remarks.** Occurs on the native grassland, mainly over humid soils.

**Brazilian range.** Midwest (except DF state), North (AM state), South (PR state), Southeast (except ES and RJ states) regions.

**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'56"S, 046°40'55"W; 16 Jan. 2018; collection number vck163; HUFABC2175 • same collection data as for preceding; collection number vck164; HUFABC2176.

***Paspalum erianthum* Nees ex Trin.**

Figure 19D

**Identification.** Perennial tussock grass, 39–56 cm height. Leaf-blades lanceolate, hairy on both sides, 9–20 cm long, 0.4–0.5 cm wide, ligulate. It is identified by its inflorescence with 3–6 alternate branches, 1.5–4.4 cm long, with short trichomes and its elliptical and hairy spikelets.

**Remarks.** Species observed scarcely on the native grassland. Considered Endangered in São Paulo state.

**Brazilian range.** Midwest, North (PA and TO states), Northeast (BA and CE states), South (PR state) and Southeast (except ES state) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'56"S, 046°42'11"W; 4 Nov. 2016; collection number vck5; HUFABC1884.

***Paspalum eucomum* Nees ex Trin.**

Figure 19E

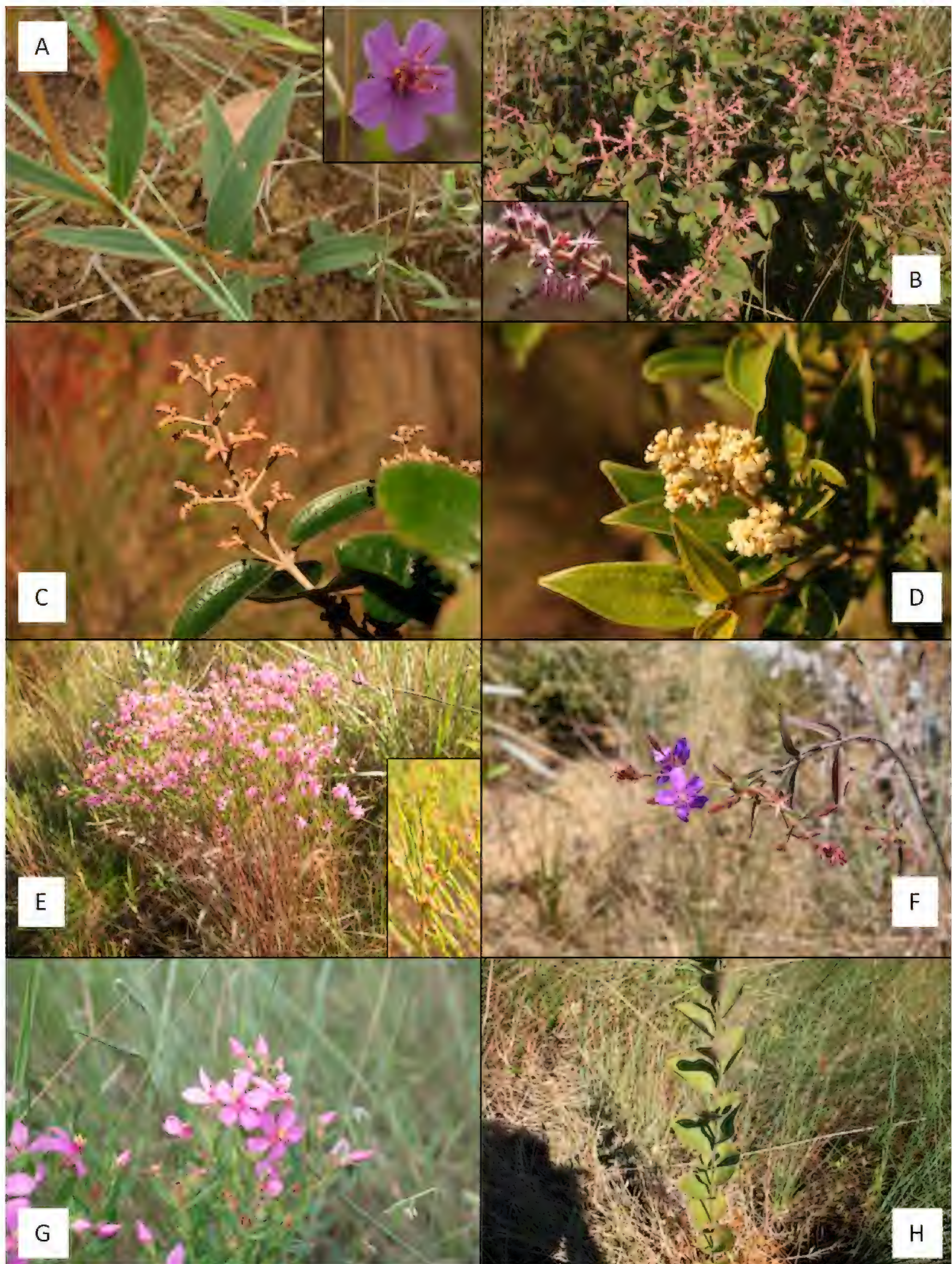
**Identification.** Perennial tussock grass, 40–82 cm height. Leaf-blades filiform, involute, glabrous or hairy, 8.5–22.0 cm long, 0.01–0.3 cm wide, ligulate. Distinguished by its inflorescence with 2 sub-conjugated branches, 5–11 cm long, with green and purplish rachis with solitary spikelets covered with white trichomes.

**Remarks.** Common species over shallow soils on the native grassland.

**Brazilian range.** Midwest (except MS state), South (PR state) and Southeast (except ES and RJ states) regions.

**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 19 Apr. 2017; collection number vck31; HUFABC1979 • Franco da Rocha, Parque Estadual do Juquery; 23°20'52"S, 046°42'24"W; 11 Apr. 2018;





**Figure 15.** MELASTOMATACEAE **A.** *Chaetogastra gracilis*, flower in detail. **B.** *Leandra polystachya*, flowers in detail. **C.** *Miconia albicans*. **D.** *M. ligustroides*. **E.** *Microlicia isophylla*, leaves in detail. **F.** *Pleroma molle*. **G.** *Trembleya phlogiformis*. MENISPERMACEAE **H.** *Cissampelos ovalifolia*.





**Figure 16.** MYRTACEAE **A.** *Campomanesia pubescens*. **B.** *Eugenia bimarginata*. **C.** *E. punicifolia*. **D.** *Psidium firmum*. **E.** *P. grandifolium*. OCHNACEAE **F.** *Ouratea floribunda*. ORCHIDACEAE **G.** *Epistephium sclerophyllum*. OROBANCHACEAE **H.** *Buchnera ternifolia*.





**Figure 17.** OROBANCHACEAE **A.** *Esterhazyia splendida*. POACEAE **B.** *Andropogon bicornis*. **C.** *A. lateralis*. **D.** *A. leucostachyus*. **E.** *Anthaenantia lanata*. **F.** *Aristida jubata*. **G.** *Arthropogon villosus*.



collection number vck283; HUFABC2148.

***Paspalum filifolium* Nees ex Steud.**

Figure 19F

**Identification.** Perennial tussock grass, 0.1–0.8 m height. Leaf-blades filiform, convolute, 19–30 cm long, glabrous, ligulate. It is characterized by its inflorescence with 2 terminal branches, with green and glabrous spikelets.

**Remarks.** Relatively common species on the native grassland.

**Brazilian range.** South (except RS state) and Southeast (SP state) regions.

**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 6 Dec. 2017; collection number vck124; HUFABC1915 • same collection data as for preceding; collection number vck125; HUFABC1916 • same collection data as for preceding; collection number vck126; HUFABC1917.

***Paspalum pectinatum* Nees ex Trin.**

Figure 19G

**Identification.** Perennial tussock grass, 0.3–1.0 m height. Leaf-blades linear, apex acute, hairy on both sides, 4.5–31.0 cm long, 0.3–0.4 cm wide, ligulate. It is identified by its inflorescence with 2 conjugated branches, 3.5–18.0 cm long, with solitary cordate-lanceolate spikelets with white trichomes on the sides.

**Remarks.** Unusual species, occurring scarcely on the native grassland.

**Brazilian range.** Midwest North (AM and RR states), Northeast (MA state), South (except RS state) and Southeast (except ES and RJ states) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'17"S, 046°41'40"W; 21 Oct. 2017; collection number vck111; HUFABC1982.

***Paspalum pilosum* Lam.**

**Identification.** Perennial, tussock, or decumbent grass, 30–95 cm height. Leaf-blades plane, lanceolate, 3–27 cm long, 0.4–0.7 cm wide, covered with hairs on both sides, ligulate. It is diagnosed by its inflorescence with one single branch, 7.5–16.0 cm long, with small trichomes and paired spikelets.

**Remarks.** Observed more frequently on disturbed sites like roadsides, but also occurring on the native grassland.

**Brazilian range.** Midwest (except MS state), North (AM, PA and RO states), Northeast (BA, MA and PE states), South (PR state) and Southeast (except ES state) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°21'04"S, 046°42'04"W; 7 Feb. 2018; collection number vck171; HUFABC2113.

***Paspalum polyphyllum* Nees in Trin.**

Figure 19H

**Identification.** Perennial tussock grass, 30–66 cm height, with rhizomes and a bambusoid aspect. Leaf blades lanceolate, plane, apex acute, 2.5–11.7 cm long, 0.2–0.6 cm wide, glabrous or densely covered with hairs on both sides, ligulate. Distinguished by its inflorescence with 1–4 alternate branches, 2.5–7.8 cm long, and its spikelets with white hairs on the margins.

**Remarks.** Relatively common species, occurring on native grassland and roadsides.

**Brazilian range.** Midwest, Northeast (BA and MA states), South and Southeast (except ES state) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'52"S, 046°42'24"W; 11 Apr. 2018; collection number vck284; HUFABC2149.

***Paspalum usteri* Hack.**

**Identification.** Perennial rhizomatous grass, ca. 1.6 m height. Leaf-blades lanceolate, plain, apex acute, 32.0–42.5 cm long, 1.5 cm wide, ligulate. Characterized by its pyramidal inflorescence with 25–35 alternate branches, 0.7–9.2 cm long, brownish, with scattered trichomes and paired spikelets.

**Remarks.** Rare species, occurring on waterlogged sites. Considered Presumably Extinct in São Paulo state.

**Brazilian range.** Midwest (MS state) and Southeast (except ES and RJ states) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'17"S, 046°41'40"W; 5 Sep. 2016; collection number vck4; HUFABC1889.

***Schizachyrium condensatum* (Kunth) Nees**

**Identification.** Perennial tussock grass, 0.35–1.1 m height. Leaf-blades linear, glabrous, 3–25 cm long, 0.2–0.8 cm wide, ligulate. It is identified by its erect contracted inflorescence, 5–45 cm long, with lots of ramifications, and its sessile spikelets, awns with 8–16 mm long.

**Remarks.** Occurring scarcely on the native grassland but common on roadsides and colonizing disturbed sites.

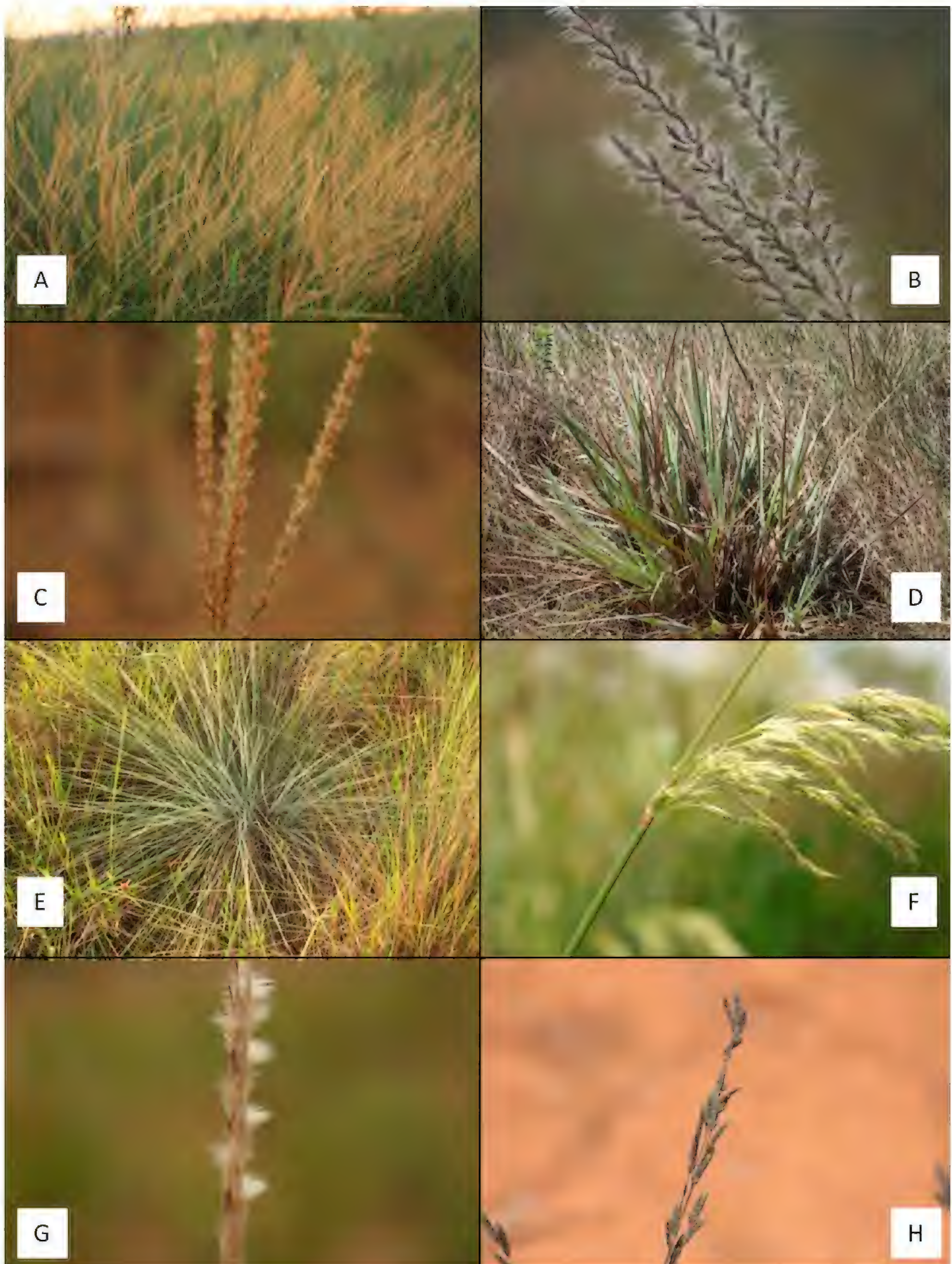
**Brazilian range.** Midwest, Northeast (BA state), South and Southeast (except ES and RJ states) regions.

**Materials examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'30"S, 046°40'36"W; 5 Mar. 2018; collection number vck216; HUFABC2058 • same collection data as for preceding; collection number vck217; HUFABC2059.

***Schizachyrium sanguineum* (Retz.) Alston**

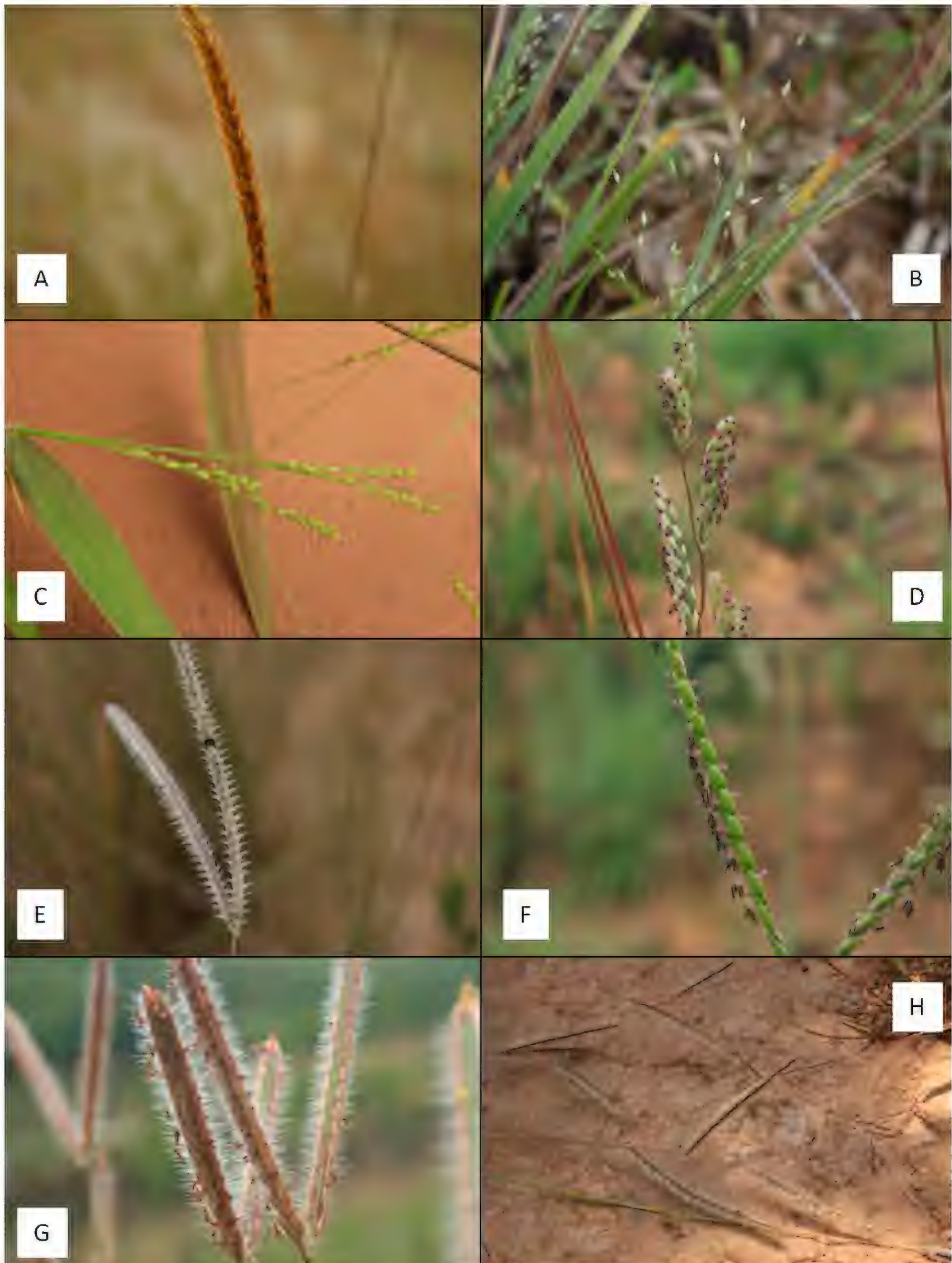
**Identification.** Perennial tussock grass, 0.65–1.5 m height. Leaf-blades linear, glabrous or hairy, 8–30 cm long, 0.2–0.5 cm wide, with marginal trichomes. Distinguished by its erect inflorescence with few to many branches and sessile spikelets with a 15–18 mm long awn.





**Figure 18.** POACEAE **A.** *Axonopus aureus*. **B.** *A. brasiliensis*. **C.** *A. marginatus*. **D.** *A. pressus*. **E.** *A. siccus*. **F.** *Calamagrostis viridiflavescens*. **G.** *Elionurus muticus*. **H.** *Eragrostis secundiflora*.





**Figure 19.** POACEAE **A.** *Mesosetum ferrugineum*. **B.** *Panicum rudgei*. **C.** *P. sellowii*. **D.** *Paspalum erianthum*. **E.** *P. eucomum*. **F.** *P. filifolium*. **G.** *P. pectinatum*. **H.** *P. polyphyllum*.





**Figure 20.** POACEAE **A.** *Schizachyrium tenerum*, inflorescence in detail. **B.** *Setaria parviflora*. POLYGALACEAE **C.** *Moninna richardiana*. **D.** *Polygala cuspidata*. **E.** *P. poaya*. **F.** *P. pumila*. RUBIACEAE **G.** *Borreria tenella*. **H.** *B. verticillata*.



**Remarks.** Common species on the native grassland and roadsides.

**Brazilian range.** Midwest, North (except AC state), Northeast (BA, MA and PE states), South (except RS state) and Southeast regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'17"S, 046°41'40"W; 26 Apr. 2018; collection number vck293; HUFABC2213.

### *Schizachyrium tenerum* Nees

Figure 20A

**Identification.** Perennial tussock grass, 30–80 cm height, ramified on the upper nodes. Leaf-blades linear, 3.5–30.0 cm long, 0.05–0.2 cm wide, glabrous, with marginal trichomes, ligulate. It is identified by its branched apical inflorescence, 2–6 cm long, pedicel covered with hairs and sessile spikelets with 10–14 mm awn.

**Remarks.** Occurs scarcely on the native grassland over shallow soils. Considered Endangered in São Paulo state.

**Brazilian range.** Midwest, Northeast (BA state), South and Southeast (except ES state) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'56"S, 046°40'55"W; 22 Aug. 2017; collection number vck73; HUFABC2005.

### *Setaria parviflora* (Poir.) Kerguélen

Figure 20B

**Identification.** Annual rhizomatous grass, 30–80 cm height. Leaf-blades linear-lanceolate, scattered trichomes on the abaxial surface, 5–30 cm long, 0.2–0.9 cm wide, ligulate. Identified by its erect spiciform panicle, 1.5–13.0 cm long, with elliptical spikelets with 4–11 bristles, 1–14 mm long.

**Common name.** Rabo-de -gato

**Remarks.** Occurs scarcely on the native grassland on roadsides and disturbed sites.

**Brazilian range.** Midwest, North (except RO state), Northeast (except CE state), South and Southeast (except RJ state) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'42"S, 046°42'06"W; 2 Feb. 2017; collection number vck26; HUFABC1902.

### *Sporobolus cubensis* Hitchc.

**Identification.** Perennial tussock grass, 50–70 cm height. Leaf-blades lanceolate with trichomes on the margin, 10–23 cm long, 0.3–0.4 cm wide, ligulate. Distinguished by its open panicle, 8–15 cm long with verticillate branches.

**Remarks.** Relatively common species on the native grassland, occurring mainly over shallow soils.

**Brazilian range.** Midwest, North (PA, RO and TO

states), Northeast (BA, PA and SE states), South (PR state) and Southeast (SP state) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'56"S, 046°42'11"W; 2 Feb. 2017; collection number vck2, vck3; HUFABC1882 HUFABC1883.

### *Urochloa brizantha* (Hochst. Ex A.Rich) R.D.Webster

**Identification.** Perennial tussock plant, 0.5–1.8 m height with short rhizomes. Leaf-blades linear-lanceolate, hairy, 8–35 cm long, 0.12–0.17 cm wide, ligulate. It is characterized by its hairy inflorescence with 1–7 unilateral branches, 4–16 cm long, with elliptical spikelets.

**Common name.** Braquiara

**Remarks.** Exotic and invasive species, very aggressive. Most common on disturbed roadsides and frequently burnt areas.

**Brazilian range.** Midwest, North (except AC, AM and AP states), Northeast (except MA state), South and Southeast (except RJ state) regions.

**Material examined.** BRAZIL – São Paulo • Franco da Rocha, Parque Estadual do Juquery; 23°20'33"S, 046°40'42"W; 6 Mar. 2018; collection number vck252; HUFABC2076.

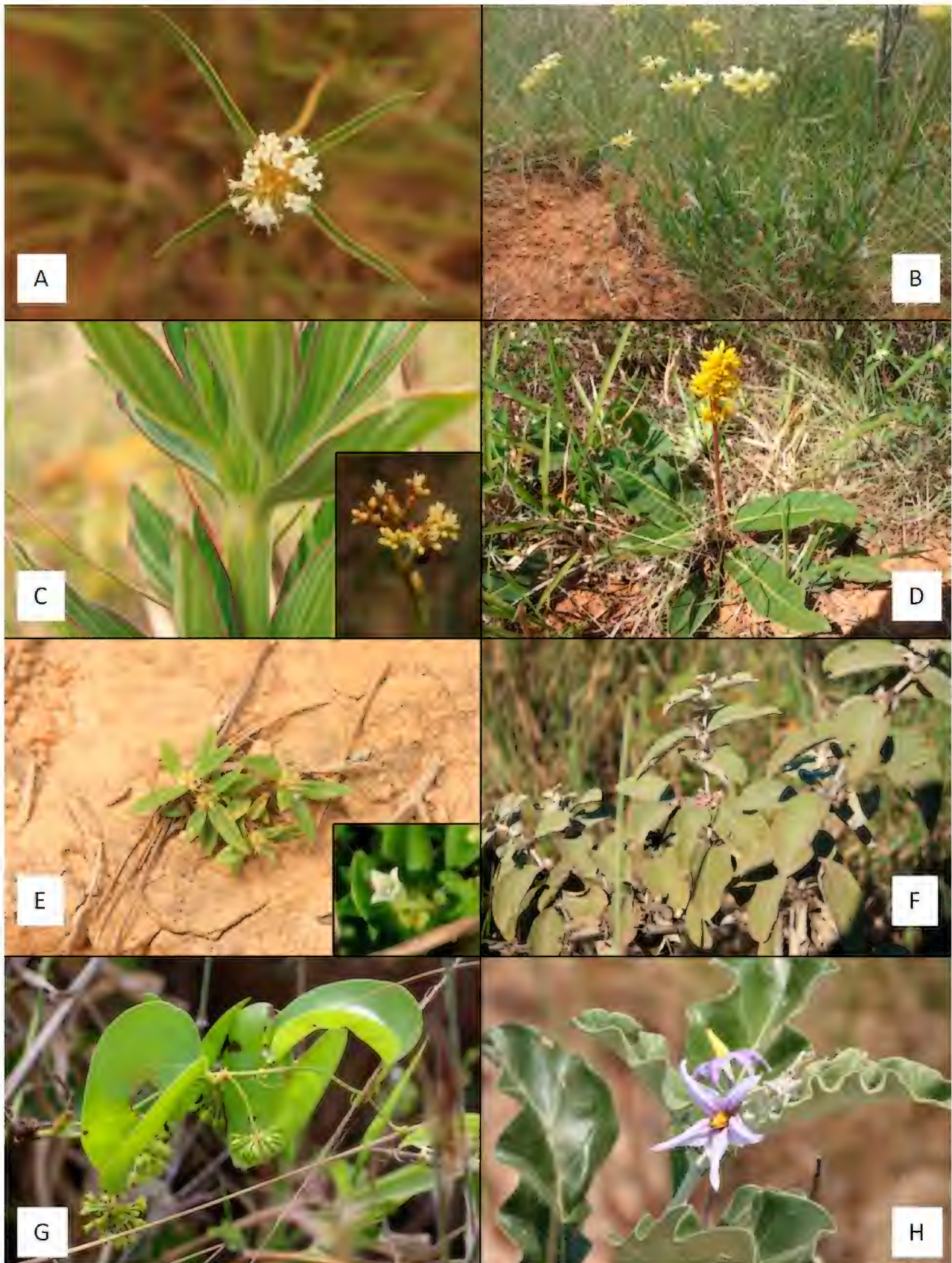
## Discussion

The high species richness observed in PEJY gives this savanna grassland high conservation priority, especially when the park's surroundings have intense anthropogenic pressures. The species richness obtained in our survey was similar to what has been reported for other areas of Cerrado in São Paulo (e.g., Batalha et al. 1997; Tannus and Assis 2004; Almeida et al. 2005; Ishari and Maimoni-Rodella 2012). When our list is combined with the survey by Baitello et al. (2013), we have a glimpse of the megadiversity present on the open formation of the Cerrado of PEJY (Mendonça et al. 2008). We observed a predominance of species from the families Asteraceae and Poaceae, as expected for the open habitats of the Cerrado (e.g., Munhoz and Felfili 2006; Carvalho et al. 2010; Ishara and Maimoni-Rodella 2012). The species richness by family in descending order was consistent with that observed by Mendonça et al. (2008) for the Cerrado biome: Asteraceae > Poaceae > Fabaceae > Melastomataceae > Rubiaceae > Myrtaceae > Lamiaceae; these data reinforce the importance of PEJY as the last preserved Cerrado grassland remnant in the MRSP.

We found *U. brizantha*, an invasive exotic species that can cause declines in savanna grassland diversity. This species is one of the main threats to native plant populations due to its fast recover and spread after fires (Durigan et al. 2007; Pereira-Silva et al. 2019), being an especially severe threat to PEJY's rare and threatened species.

The variation in species richness observed between our survey and Baitello et al.'s (2013) study might be





**Figure 21.** RUBIACEAE **A.** *Borreria warmingii*. **B.** *Galianthe angustifolia*. **C.** *G. grandifolia*, inflorescence in detail. **D.** *Palicourea rigida*. **E.** *Richardia schumannii*, flower in detail. **F.** *Sabicea brasiliensis*. SMILACACEAE **G.** *Smilax fluminensis*. SOLANACEAE **H.** *Solanum lycocarpum*.





**Figure 22.** SOLANACEAE **A.** *Solanum paniculatum*. SYMPLOCACEAE **B.** *Symplocos oblongifolia*. TURNERACEAE **C.** *Piriqueta aurea*. **D.** *Turnera hilaireana*. VERBENACEAE **E.** *Lantana trifolia*, fruits on detail. **F.** *Lippia lupulina*. **G.** *Lippia origanoides*. **H.** *Stachytarpheta cayennensis*, flowers in detail.



due to differences in sampling methods. Baitello et al. (2013) made the continuous floristic survey in a non-systematic and long-term way for six years. In our study, plots were systematically sampled for a set amount of time, and these data were complemented by collections made during walks. The use of plots facilitates the finding of small, inconspicuous, rare species (e.g., *Richardia schumannii* and *Polygala pumila*) which occur sparingly in the vegetation (Garrard et al. 2008; Chen et al. 2009). This method revealed seven locally threatened species that had not yet been reported from the study area.

The species richness assessment by plant habit indicates that 62.5% of the species sampled are herbaceous or sub-shrub plants. Percentages close to that were observed in other remnants of savanna grassland in São Paulo, such as Pirassununga (72.3%; Batalha et al. 1997) and Itirapina (78.5%; Tannus and Assis 2004). Despite the predominance of non-woody plants, some portions of the rugged and mountainous terrain of PEJY (Amorim et al. 2017) seem to favor the shrub-tree vegetation, resembling a campo cerrado/cerrado *stricto sensu*. Large species individuals dominate in these areas; examples include *Dalbergia miscolobium* Benth, *Kielmeyera coriacea* Mart. & Zucc., *Roupala montana* Aubl., and *Plenckia populnea* Reissek, which are typical woody plant species of the Cerrado biome (Eiten 1972). As the diversity of soils, reliefs, and physiognomies promotes environmental heterogeneity and consequently higher species richness in plants (Kumar et al. 2006), the richness observed in PEJY might be associated with local habitat diversity, despite its small and isolated area.

The floristic dissimilarity observed between PEJY and the remnants of savanna forest (cerradão) and savanna (cerrado *stricto sensu*) in the countryside of the state was expected (e.g., Durigan et al. 2003). The cluster analysis by floristic similarity suggests that geographical proximity, soil, and climate may influence the remnants flora composition in this analysis. The temperature, both in Ponta Grossa and the MRSP (Juquery, Jaraguá, and Butantã areas), is mild, and humidity is high due to the greater latitude and proximity to the coast (Alvares et al. 2013). On the other hand, the countryside remnants (Assis, Itirapina, Mogi-Guaçu, Pedregulho, Pirassununga, Pratânia, and Santa Rita do Passa Quatro) have a hotter, seasonal climate, more similar to those observed on the core areas of the Cerrado (Brasília and Alto Paraíso; Alvares et al. 2013). Despite this climatic similarity, we observed a strong floristic dissimilarity between the core sites and the southern sites (São Paulo state).

Other studies also reported floristic dissimilarities (Jaccard <25 %) among grassland formations of Cerrado (e.g., Durigan et al. 2003; Garcia et al. 2009). On the other hand, when comparing only woody formations in the Cerrado of São Paulo, they are similar to each other than when comparing only grassland formations (e.g., Durigan et al. 2003; Pereira-Silva et al. 2006; Carvalho et al. 2010; Ishara and Maimoni-Rodella, 2012). The

floristic dissimilarities might be related to the concentration of woody physiognomies in the central-western portion of the state (cerradão and cerrado *stricto sensu*) on sandy and deep soils (Durigan et al. 2003). The lower similarity of the grassland formations of São Paulo may be associated with the geographic location of fragments, with a disjunction between the eastern (MRSP and Vale do Paraíba) urban matrix and the central-western agrosilvopastoral matrix. The floristic dissimilarity observed between these two areas may be reinforced by the low natural dispersion capacity of small herbaceous species (Levin et al. 2003), which hinders the flow of propagules among communities and reduces the ability to recolonize disturbed grassland areas (Sheth et al. 2020).

The proximity of the grasslands of Butantã (Joly 1950) and PEJY (24 km apart) and their floristic similarity suggest that in the last seven decades, these areas could have been at least functionally connected. Historical evidence indicates that a diverse landscape of grasslands was present on hilltops and Atlantic Forest extended throughout the depressions and valley bottoms (Usteri 1911; Raimundo 2006). A similar scenario currently exists in PEJY (Baitello et al. 2013). Among the species in common between PEJY and the grasslands of Butantã are many species typical of the Cerrado biome, such as *Aegiphila verticillata* Vell., *Baccharis aphylla* (Vell.) DC., *Byrsonima intermedia* A.Juss., *Cambesedesia espora* (A.St.-Hil. ex Bonpl.) DC., *Erythroxylum campestre* A.St.-Hil., *Echinolaena inflexa* (Poir.) Chase, and *Loudetiopsis chrysotrix* (Nees) Conert (Eiten 1972; Ratter et al. 2006; Ribeiro and Walter 2006). Additionally, some locally threatened species were also observed in both areas, such as *Mesosetum ferrugineum* (Trin.) Chase, *Paspalum erianthum* Nees ex Trin., and *Polygala pumila*. With the growth of São Paulo city and its surroundings, the grasslands of Butantã were quickly replaced by densely urbanized areas, leaving only small fragments of grassland (Raimundo 2006). Therefore, PEJY is of critical importance as the last preserved grassland remnant of Cerrado within Brazil's largest metropolis. PEJY also has historical relevance as an example of the pristine landscape in the MRSP.

The species diversity found in this area by us and a previous study (Baitello et al. 2013) is in contrast to the site's surroundings within the MRSP. The park is surrounded by growing dense urban areas, and threats such as increased fires and the spread of invasive plant species. The park is also relatively small (ca. 2,000 ha) and physically and possibly functionally isolated from other grassland savannas. These urbanized landscape surrounding PEJY reinforce the need for conservation of this grassland savanna and its species, as recommended in other parts of the world (Bond and Parr 2010; Parr et al. 2014; Veldman et al. 2015; Bond 2016). We suggest a combination of *in situ* conservation strategies, involving the protection and rehabilitation of threatened species, some of which were identified herein. However, ensuring



the protection of species genetic resources of this area in its urban context requires local actions for inspection, management, and control of adverse human impacts, such as the indiscriminate use of fire and other recurrent threats in protected areas of the MRSP (Durigan et al. 2007; Arce et al. 2014).

Despite its small size and the human disturbance of its urban matrix, this protected area is vital for the biological conservation of grassland species, including those of restricted occurrence threatened by extinction. The low similarity of PEJY with other areas analyzed demonstrates its importance as one of the last remnants for the conservation of savanna grassland in the MRSP. Our results contribute to the understanding of the current conservation status of the savanna grassland of PEJY at a local scale and demonstrate the need for additional information on this vegetation type in the state of São Paulo. Additional surveys are needed to provide a framework for developing environmental protection and conservation policies for the Brazilian savanna grassland. To ensure the protection of PEJY, we also recommend additional inventories and studies to assess the current conservation status at the regional scale.

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## Authors' Contributions

All authors contributed to the study conception and design. EH and EFLPS were the Master's degree advisors of the first author and EFLPS was the coordinator of the project. Data collection was performed by VCK and EFLPS. Data analysis was made by VCK. The first draft of the manuscript was written by VCK. EH and EFLPS commented and made significant contributions to versions of the manuscript. All authors read and approved the final manuscript.

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